THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXIV. No. 863.] LONDON, NOVEMBER 25, 1879. [31ST YEAR.] Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,
CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
BLACKWALL, E.;
OFFICES:
26, 27, & 28, FENCHURCH ST.,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
SEVERAL PRIZE MEDALS. ESTABLISHED OVER 20 YEARS.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
PROPRIETORS: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
WORKS: BRIXHAM, TORBAY.

THOMAS PROUD,
BROOKFIELD GAS APPARATUS WORKS,
105, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpieces, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
MANUFACTURERS OF
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
HEAD LONDON OFFICE:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
LICENSEES AND MANUFACTURERS OF
HUNT'S
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
ESTABLISHED 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE.
See Page 806.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

CHANGE OF ADDRESS.
GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:

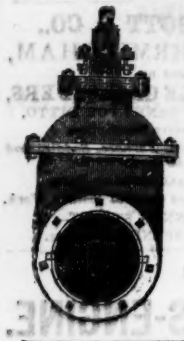
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

WELLINGTON TUBE WORKS,

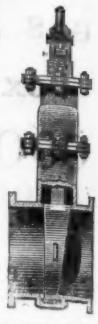
GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.



C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves have taken the place of the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES

OF THE

FRICTIONLESS DRY GAS-METERS,

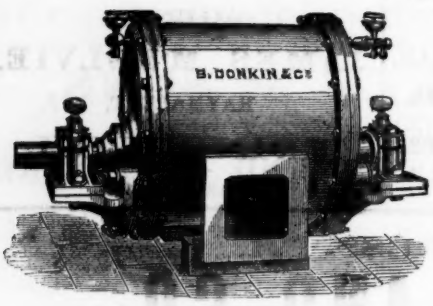
Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.



J. BEALE'S

NEW PATENT GAS-EXHAUSTERS,

For the Manufacture of which

MESSRS. B. DONKIN & Co.

POSSESS THE SOLE RIGHT.

Made with two Outside Bearings and with all the Latest Improvements.

FULL PARTICULARS ON APPLICATION.

BERMONDSEY, LONDON, S.E.

Messrs. B. D. & Co. are also Manufacturers of Steam-Engines and of Improved Gas and Water Valves, &c., &c.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.,

GAS-FITTERS TOOLS. VALVES. COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES: 97, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

HANNA, DONALD, & WILSON,

(ESTABLISHED 1851,)

GAS ENGINEERS & CONTRACTORS

FOR THE

ERECTION OF GAS AND WATER WORKS,

TELESCOPIC AND SINGLE-LIFT GASHOLDERS,

CAST AND WROUGHT IRON GASHOLDER-TANKS,

IMPROVED FIXED OR TRAVELLING HYDRAULIC PURIFIER-COVER LIFTERS,

PURIFIERS, CONDENSERS, SCRUBBERS, EXHAUSTERS, AND PUMPING-ENGINES,

TAR AND LIQUOR PUMPS, HYDRAULIC SLUICE AND SLIDE VALVES, LAMP-POSTS AND HYDRANTS COMBINED.

DESIGNS AND ESTIMATES SUPPLIED ON APPLICATION.

London Office: 9, FENCHURCH STREET, E.C.

ABERCORN FOUNDRY & ABBEY WORKS, PAISLEY, N.B.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS.

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

HONOURABLE MENTION. **J. E. WILLIAMS & CO.,** PARIS EXHIBITION, 1878.

SOLE MANUFACTURERS OF THE

SPECIAL METALLIC OXIDE PAINT,

VICTORIA PAINT WORKS, COLLYHURST, MANCHESTER.

G. J. EVESON

Has on Sale a large quantity of Cannel, South Yorkshire, Wigan, and Ruabon Coal, purchased previous to the late advances.

Prices on Application.

GAS COAL AND CANNEL CONTRACTOR, BIRMINGHAM.

SAMUEL CUTLER & SONS,

CONTRACTORS FOR GAS & WATER WORKS, GENERAL ENGINEERS, IRONFOUNDERS & MANUFACTURERS OF

GASHOLDERS, TANKS, PURIFIERS,

SCRUBBERS, VALVES, EXHAUSTERS, IRON ROOFS, BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORKS.

S. C. & SONS undertake the entire erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the supplying and laying of MAINS.

They make a speciality of supplying every requisite whatever for Gas-Works, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

Manufacturers of MORRIS & CUTLER'S PATENT CONDENSER & CUTLER'S PATENT GAS-WASHER.

DESCRIPTION OF MORRIS & CUTLER'S PATENT CONDENSER.—The Condenser may consist of pipes arranged in tiers, or in any other form most convenient to the site available, each tier being connected with special connections, and containing within same either one or more coils of smaller pipe through which water is passed, being supplied from any convenient source of supply, the water passing in an opposite direction to the gas, so that the coldest water is at the gas outlet. The power of the Condenser can be regulated precisely in proportion to the quantity of water allowed to pass through, which is not in any way contaminated, but simply heated by the hot gas, and advantage can be taken of its being at a high level to carry it to a high-level cistern, from whence it can be used for supply to boiler or any other purpose. The Condenser itself may form the support for a high-level cistern. By an arrangement of valves the water may be shut off, and an air orifice opened, when air will pass through instead of water, or both air and water can be shut off. The power of the Condenser is, therefore, entirely under control. The Condenser may be seen in operation at the Brentford Gas-Works.

For further Particulars, apply to Mr. F. MORRIS, GAS-WORKS, BRENTFORD, or to S. CUTLER & SONS, PROVIDENCE WORKS, MILLWALL (Near the Steamboat Pier), LONDON, E.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

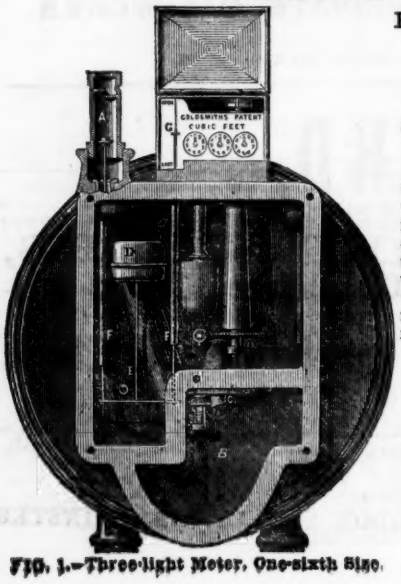


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

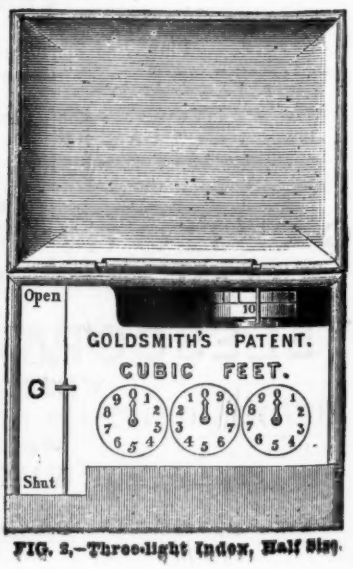
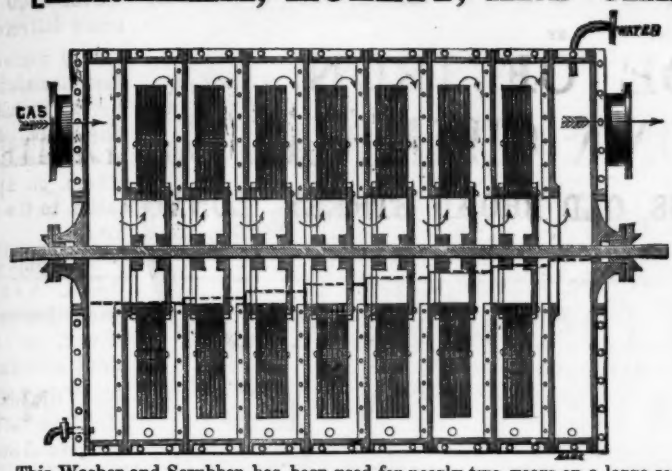


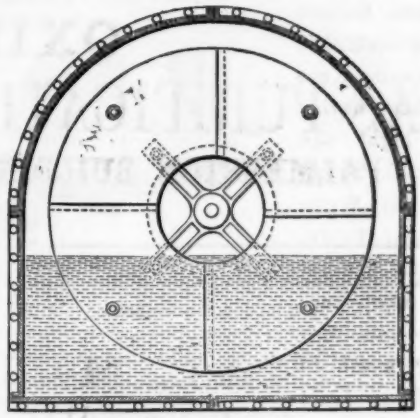
FIG. 2.—Three-light Index, Half Size.

THE

"STANDARD" WASHER & SCRUBBER.

[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]





This Washer and Scrubber has been used for nearly two years on a large scale at the Works of The Gaslight and Coke Company, Bromley-by-Bow, at which station there are now several in operation and in course of construction. There is also one in use at the Pancras Station, King's Cross, of the same Company, which is purifying 1,500,000 cubic feet of gas per day. At the Gas-Works of the Corporation of Leeds, a large one has been erected, which is giving complete satisfaction. The Special Merits of this Washer are as follows:—

That it is a very effective Condenser, so that it is not absolutely necessary to reduce the temperature of the gas to 60°, or thereabouts, to make the Washer effective. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

D. HULETT, Esq. *The Gaslight and Coke Company, Bromley-by-Bow, May 3, 1877.*

Dear Sir,—In answer to your inquiries respecting the results of the working of your Patent Washer, I beg to state that I find it a very efficient machine. I have had it in operation for some time, and passed gas through it continuously at the rate of 100,000 cubic feet per hour, and obtained from it 11 gallons of 10 oz. liquor per ton of coal carbonized—results which appear to me very satisfactory for so small a Washer. It works very smoothly, taking but little power, and giving no pressure. I have it still in operation, and am perfectly satisfied with its working.

I am, dear Sir, yours truly, (Signed) W. B. WRIGHT.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Leeds Corporation Gas-Works, York Street, Leeds, Dec. 6, 1878.*

Gentlemen,—The Scrubber-Washer erected by you at these works, and which has been in use for six months, has proved to be, so far as we have been able to test it, thoroughly efficient. We are at present making 32,000 feet of gas per hour, and are entirely dependent on this apparatus for the removal of Ammonia, and the **Gas is perfectly free from that impurity in the sixth chamber**, so that four chambers remain to deal with an increasing make of gas. Owing to insufficient condensers, the gas was in the summer admitted to the Scrubber at a temperature of 70°, but was reduced therein to 61°, or that of the atmosphere. The volutes are driven at the rate of four revolutions per minute, and, working at that speed, there is not the slightest difference between the inlet and the outlet pressure. Clean water supplied at the rate of 10 gallons per ton of coal carbonized is converted into liquor of from 10 oz. to 13 oz. strength **in once traversing the vessel.** The apparatus is extremely simple and compact, occupies but little space, and requires no foundation. I shall be surprised if it does not eventually become extremely popular.

I am, Gentlemen, yours faithfully, (Signed) HENRY WOODALL, Engineer.

Messrs. KIRKHAM, HULETT, and CHANDLER. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say, the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, **it takes out every particle of Ammonia,** while purifying more Gas than it was intended to do. I enclose particulars of a fortnight's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c. (Signed) JOHN CLARK.

The following Table shows the results of the working of one of these Washers, lately erected to purify 60,000 feet of Gas per Hour, at the St. Pancras Station of The Gaslight and Coke Company:—

1879.	Nos. of the Divisions and Strength of Liquor in each.										Water used per Ton of Coals.	Gas Purified per Hour, Cubic Feet.	Ammonia on Outlet.	Temperature.			Pressures.		Revolutions per Minute.
	1	2	3	4	5	6	7	8	9	10				Inlet.	Outlet.	Atmo-spheres.	Inlet, Inches.	Outlet, Inches.	
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.									
January 1	8½	6¾	5	3½	2½	1½	¾	¼	0	0	10 Gallons.	52,000	Nil.	77°	73°	48°	24	23	7½
„ 2	8¾	7	6	4½	3½	2½	1½	¾	¼	0	10 „	57,000	Nil.	73°	66°	32°	21½	20½	4
„ 3	9½	8	6	3¾	3	2½	1½	¾	¼	0	10 „	60,000	Nil.	75°	68°	40°	23½	22	4
„ 4	9½	7¾	6¼	4¼	3¼	2¼	1¼	¾	¼	0	10 „	65,000	Nil.	74°	68°	33°	24	22½	5
„ 5	9½	7	6	4	3	2¼	1¼	1	¼	0	10 „	34,000	Nil.	77°	68°	35°	14½	14	5
„ 6	9¼	7¼	6¼	4¼	3	2¼	1½	1	¼	0	10 „	63,000	Nil.	72°	66°	27°	24	22½	4½
„ 7	11	9	7	5½	3¾	3	1¾	1½	¼	0	10 „	59,000	Nil.	74°	66°	31°	25	23½	5
„ 8	9½	7½	6	4½	3	2	1	½	¼	0	10 „	78,000	Nil.	73°	61°	31°	28	26½	4½
„ 9	11	9	7	5	3½	2½	1½	1	¼	0	10 „	82,000	Nil.	74°	67°	33°	27½	25½	5
„ 10	10¾	8½	6¾	5	3½	2½	1½	1	¼	0	10 „	66,000	Nil.	76°	64°	28°	28½	27	5
„ 11	12½	10	7¾	5¼	4¼	3¼	1¾	1¼	¼	0	10 „	61,000	Nil.	73°	64°	27°	26½	25½	5
„ 12	11	8¾	6¾	—	—	—	1¼	¾	¼	0	10 „	39,000	Nil.	74°	64°	27°	26½	25½	5
„ 13	13	10¾	8¼	6	4¾	3¼	2	1¼	¼	0	10 „	78,000	Nil.	73°	65°	42°	28	26	5

Messrs. KIRKHAM, HULETT, and CHANDLER. *Corporation of Birmingham, Gas Department, Saltley Works, May 23, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Working Results obtained from KIRKHAM, HULETT, *and* CHANDLER'S *Patent "Standard" Washer and Scrubber at the St. Pancras Station of The Gaslight and Coke Company, London, March 6, 1879.*

Gas passing per Hour, Cubic Feet.	—	Impurities in Gas per 100 Cubic Feet.			Temperature.		Pressure in Inches.	Revolution of Apparatus per Minute.	—	No. of Divisions and Strength of Liquor.										Water Used during Experiment. Gallons.
		SH_2	CO_2.	Grains. NH_3.	Washer.	Air.				—	—	—	—	—	—	—	—	—	—	
64,000	Inlet	2·00	2·00	158·8	72	57	21	4¼	Twaddel deg. at 60°	5·3	4·9	2·85	2·35	1·7	1·05	0·6	0·3	0·15	0·1	63
	Outlet	1·50	1·50	0·8	68	57	20		Acid, ounces.	11·0	8·4	6·3	4·5	2·7	1·7	1·3	0·7	0·3	—	

WASHER-SCRUBBERS OF THIS PATENT ARE IN COURSE OF CONSTRUCTION FOR BECKTON, BRADFORD, GREENWICH, WOOLWICH, AND SEVERAL OTHER GAS-WORKS.

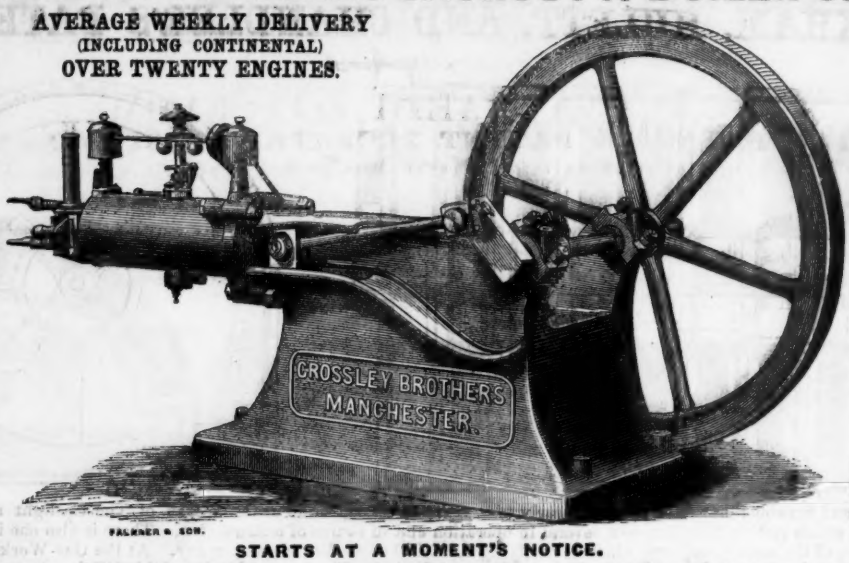
For further particulars and testimonials, address

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

AVERAGE WEEKLY DELIVERY
(INCLUDING CONTINENTAL)
OVER TWENTY ENGINES.

The durability of these Engines is now established by experience, one of them having run night and day at the Hinckley Gas-Works for over Twelve months without any expenditure for repair; this being equal to about 2½ years average work.



Over 1900 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE.

(Otto and Crossley's Patents, 1876 and 1877,)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. **SIZES** { NOMINAL HORSE POWER ½ 1 2 3½ 6 8 12 16 / MAXIMUM HORSE POWER ½ 1½ 2½ 4 9 12 18 24 } **OFFERED.** CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

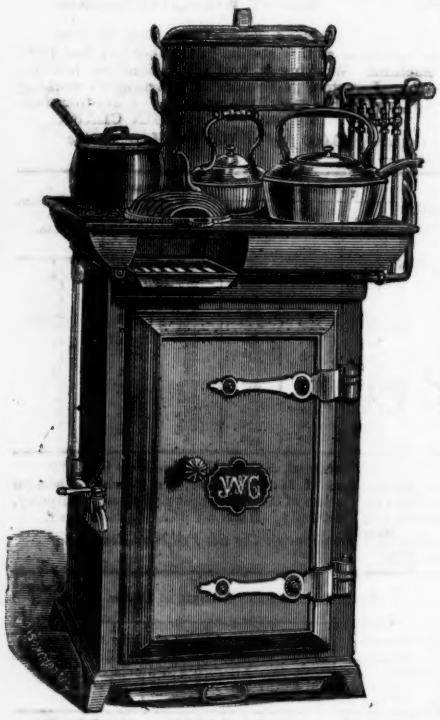
WORKS AND HEAD OFFICES: Gt. Marlbro' St., Gloster St.

CROSSLEY BROTHERS, MANCHESTER.

LONDON HOUSE: 116, Queen Victoria St., E.C.

THE NEW GAS COOKER.

40 PER CENT. OF GAS SAVED.



No. A510 same as our **No. A152,**
BUT LINED WITH PATENT NON-CONDUCTOR.
Will Roast, Bake, and Fry, and with Three Burners for Boiling.

SIZE.
Outside—30in. high, 20in. wide, 20in. deep.
Inside—19½in. „ 14in. „ 17in. „
Price . . . . . £4 14s. 6d.

No. A500.
LINED WITH PATENT NON-CONDUCTOR.
Is fitted with Roasting and Baking Oven and Four Burners for Boiling.

SIZE.
Outside—34in high, 20in. wide, 19in. deep.
Inside—30in. „ 16in. „ 17in. „
Hot Plate—24in. by 23in.
Price . . . . . £7 10s. 0d.

No. A505.
Same as with Roasting and Baking Oven, a Broiler or Toaster, a Chop Griller, a Hot Water Boiler, and Three Burners for Boiling.
Hot Plate—26in. by 24in.
Price . . . . . £9 15s. 0d.

These Cookers are jacketed, on the sides, top, and door, with a new and very efficient non-conducting material, by the use of which a **saving** of gas to the extent of **40 per cent.** is effected.

Gas Companies who are selling or hiring stoves should see these stoves. Catalogues and particulars on application to

JOHN WRIGHT & CO., ESSEX WORKS, BROAD STREET, BIRMINGHAM.

London Warehouses: { 155a, Upper Thames Street, / 1, Little Bush Lane.

TANGYE BROTHERS AND HOLMAN,

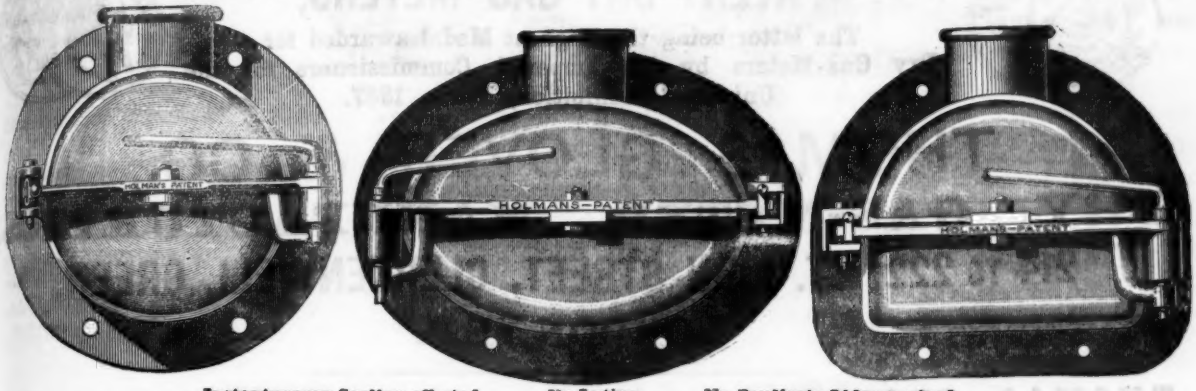
CORNWALL HOUSE, 35, QUEEN VICTORIA STREET, LONDON, E.C.,

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland).

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal Advantages of this arrangement over the ordinary form of Governor are as follows:—

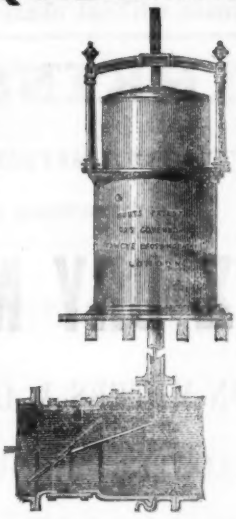
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

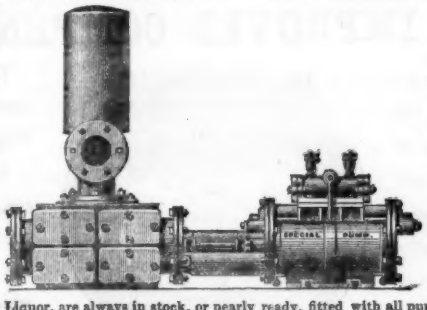
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	21
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

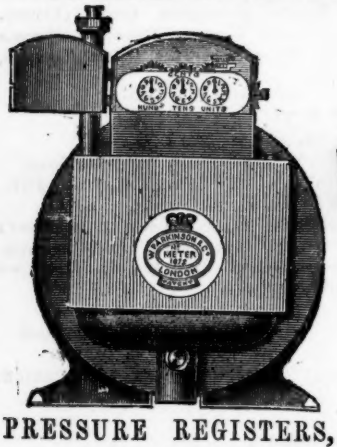
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



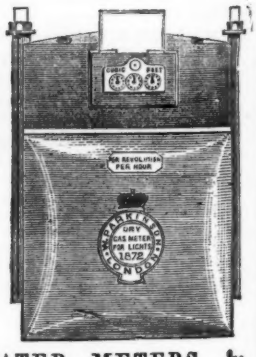
(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,

STATION-METERS & GOVERNORS,

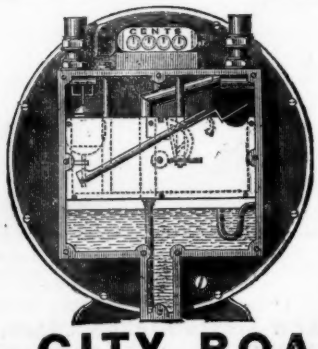
EXHAUSTER REGULATORS,



PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

CONTENTS.

Circular to Gas Companies:— PAGE
The Scheme for the Amalgamation of the South Metropolitan and Phœnix Gas Companies . . . 809
The Proposed Amendment of the Chartered Gas Company's Act of 1876 . . . 809
Birmingham Corporation Gas Supply . . . 810
Doncaster Corporation Gas Supply . . . 810
Extraordinary Revelations as to the Hindley Local Board Gas-Works . . . 810
The Electric Light at Liverpool and on the *Mendoza* . . . 810

Water and Sanitary Notes:—
The Corporation of London and the Home Secretary's Action respecting the London Water Supply . . . 811
The Report and Accounts of the Lambeth Water Company . . . 811
Sewage Difficulties at Looe . . . 811

Leading Articles:—
Gas Legislation for 1879 . . . 811
Water Legislation for 1879 . . . 812

Communicated Article:—
The Utility of Water Filters. By "Isca" . . . 813

Correspondence:—
The Removal of Tar from the Hydraulic Main . . . 815
The Lighting of the Streets of London in the Eighteenth Century . . . 815
The Modern Phase of Physical Science . . . 815

Legal Intelligence:—
High Court of Justice—
Common Pleas Division—Smith (Appellant) *v.* Hickman (Respondent) . . . 816
Exchequer Division—Tatton *v.* The Staffordshire Potteries Water Company . 816
Eastbourne County Court—The Liability of Water Companies for Accidents caused through Broken Mains . . . 816

Miscellaneous News:—
Wallsey Local Board Gas and Water Supply . . . 810
The Water Supply of Limerick . . . 810
Another Use for Gas Tar . . . 810
Society of Arts . . . 813
Salford Sewage Works . . . 815
Public Lighting at Wymondham . . . 816
Benzoline *v.* Gas for Street Lighting . . . 816
Metropolis Gas Supply . . . 817
Metropolis Water Supply . . . 817
The Amalgamation of the South Metropolitan and Phœnix Gas Companies . . . 817
Urban Water Supply . . . 818
Lambeth Water-Works Company . . . 818
Meeting of the Georgetown (British Guiana) Gas Company . . . 819
Heywood Local Board Water-Works Arbitration . . . 819
Meeting of the Bombay Gas Company . . . 820
Birmingham Corporation Gas Supply . . . 821
Hindley Local Board Gas Supply . . . 822
Doncaster Corporation Gas-Works . . . 823
Middleton and Tonge Improvement Commissioners Gas Supply . . . 823
Explosion at the Bradford Corporation Gas-Works . . . 823
Tunnel Outlets from Storeage Reservoirs . . . 823
Water Gas: Its History and Manufacture . . . 824
Trade Reports . . . 824
Barmouth District Gaslight and Coke Company . . . 825
Sale of Shares in the British Gaslight Company at Norwich . . . 825
Thurso New Gas Company, Limited . . . 825
Sale of Shares in the Bakewell Gas Company . . . 825
Newhaven Gas and Coke Company, Limited . . . 825
General Electric Society, Limited . . . 825
The Accident at the Phœnix Gas-Works . . . 825
Carnarvon Corporation Gas Supply . . . 825
Boring for Water at East Dereham . . . 825

Register of Patents:—
Evans, J.—Steam Pumps, &c. . . . 825
Pettersson, A. K.—Automatic Feed Regulators for Carburetters . . . 825
Michel and Frager—Water-Meters . . . 826
Cutler, S.—Manufacture of Gas . . . 826
Abel, C. D.—Igniting the Charges of Gas Motor Engines . . . 826
Hallewell, R.—Gas Engines, &c. . . . 826
Ashworth, G. K.—Valves or Taps for Steam, Water, &c. . . . 826
Applications for Letters Patent . . . 826
Patents which have passed the Great Seal . . . 826

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 25, 1879.

Circular to Gas Companies.

We publish in another column particulars of the scheme which has just been laid before the Board of Trade for the amalgamation of the South Metropolitan and the Phœnix Gas Companies. In its broad outlines, the document necessarily resembles that recently sanctioned by the Privy Council for the union of the Surrey Consumers Company with the South Metropolitan Company; but there are naturally some differences due to the peculiarities of the case. The digest of the scheme, which we publish, will furnish very complete information as to the details, but for the advantage of some readers who may not have leisure to go through this digest, we notice the leading features. The scheme is promoted to bring about the union of the two great Companies south of the Thames, and the importance of the combination, both to consumers and to the Companies, can hardly be over-estimated. To the former it will bring the advantages of better and cheaper gas, and to the latter the benefits of enhanced dividends. The capital of the United Company will be of a varied character, and the dividends payable upon it also slightly vary. There are, in fact, five classes of capital, three entitled to the maximum amount of dividend payable under the scheme, up to eleven per cent.; but beyond this, one-half of any additional dividend earned is to be payable to the Shareholders of the original South Metropolitan Company, in addition to their own proportion of the larger dividend. The holders of D capital, limited to seven and a half per cent., will not participate in any increased dividend, but, at the same time, they are protected from loss until the dividends on the A, B, and C classes are reduced below seven and a half per cent., and then all four classes share alike. The same rule is to apply to the E capital, limited to five per cent. The thought of the dividends of this great Company being reduced all round to less than five per cent. is enough to make the gas world quake. We imagine, however, that such a catastrophe will never occur. Whatever may be the future of Gas Companies, so long as gas is made and sold, the profits of the Companies supplying it are certain to be better than this. It remains to be seen whether or not the Board of Trade will sanction the eleven per cent. arrangement proposed by the scheme. We know of no circumstances in the case of the Phœnix Company which will justify a higher rate than that which was granted under the scheme for the amalgamation of the Surrey Consumers with the South Metropolitan Company—namely, to share and share alike up to ten and a half per cent., beyond that to divide the surplus as proposed in this scheme. As regards further issues of capital, the scheme provides that the unissued sum of £10,000 of B capital shall be raised first; then the remaining £36,000 of D capital; and, lastly, the unissued sum of £240,000 of C capital authorized by the South Metropolitan Company's Act, 1876. It is also provided that all the capital may be converted into stock. It is proposed that the Directors of the United Company shall be twelve in number, and the Directors of the Phœnix Company are, in the scheme, directed to select five of their number to co-operate with the seven of the South Metropolitan Company. The selection will be a little invidious; but as retiring Directors are to be very liberally compensated, we do not suppose that any one will much regret retiring, and giving up his seat at the Board. We have just said that the Directors are to be twelve in number, but there is an opportunity offered for the appointment of a thirteenth, in the person of Mr. George Livesey, the able Secretary and Engineer of the South Metropolitan Company. We confess to a feeling of regret at the prospect of this gentleman's retirement from his active duties, but he has well earned a dignified leisure. As a Director, his eminently useful services will, naturally, be continued to the Company, who may, in fact, derive all the benefits which might have been obtained by the continuation of Mr. Livesey in his duplicate post. Of course, this amalgamation will involve a good many changes in the *personnel* of the Companies. Some officers must retire, and we are happy to see that the scheme makes provision for liberal compensation. Salaried officers may be compensated by annuities, and officers not entitled to annuities may be rewarded; and the annuities which would be justified by ordinary usage and law may be increased by consent of the Board of Trade. Weekly servants whose services are dispensed with may be compensated by gratuities, according to the discretion of the Directors. As regards price in relation to dividend, it is provided that if the charge of 3s. 4d. per thousand feet be maintained in the district of the Phœnix Company, and 3s. per thousand feet in the South Metropolitan Company's district, the dividends payable on the different classes of capital shall, for eighteen months after the commencement of the scheme, be according to the South Metropolitan Company's Act, 1876. We should have been very glad to see one uniform price all over the district of the United Company; but a drop of fourpence per thousand feet in the Phœnix Company's district would represent in rental a large sum, which perhaps at present cannot be spared, notwithstanding the fact that the sacrifice of it under the scheme would permit of higher dividends being paid to the Shareholders of the Phœnix Company. We have been writing as though this scheme were already sanctioned, which it probably will be, though not in the precise form which lies before us. The alterations, however, we are satisfied, will be inconsiderable, and we hope that before the end of the year we shall be able to congratulate the United Company on having obtained their object. We should have said that in the event of the amalgamation being sanctioned, it will come into operation on the 1st of January, 1880.

The citizens of London have long been desirous of having an alteration made in the law regulating the forfeitures to be inflicted on The Gaslight and Coke Company for deficiencies in the illuminating power, pressure, and purity of their gas. They have also for a considerable time insisted that the gas

should be tested in the City of London, at the place where it is consumed, and not at a distance. An Act of Parliament is not required to authorize the Gas Referees to change the position of the testing-places; therefore we may in a short time, if it be not already determined upon, hear that three stations will be set up at the valve-houses through which passes all the gas consumed in the City. We are not aware that any tests for pressure have as yet been made; but the plan suggested by the Gas Committee of the Corporation, in the report presented to the meeting of the Court of Common Council last week, and published in another column, is an excellent one—namely, to set up at the testing-stations self-registering apparatus, which will record the pressure throughout the twenty-four hours. We do not regard the test for pressure at a street-lamp as at all satisfactory, unless a lamp be chosen in which the gas is giving a good flame. A short Act, the Bill for which will, no doubt, be introduced in the next session, will put all these matters right, and, we trust, satisfy both Corporation and Company.

At a meeting of the Birmingham Town Council held last week, the report of the Gas Committee for the three months ending the 30th of September, was presented. The undertaking progresses apace. During the past quarter nearly 14 million feet more gas was sold than in the corresponding quarter last year. Similarly the use of gas for other than illuminating purposes continues to increase, and the Corporation have sold in the same period 152 gas-stoves, fires, &c. We should have referred above to the fact that the increase in the consumption of gas was not at the usual rate, owing possibly to the circumstance that those who are anxious and willing to be supplied with gas had already had their requirements satisfied; but it is possible that, as Alderman Chamberlain puts it, the diminished increase resulted from bad trade and milder weather. It may be, however, that, as the undertaking progresses, it will become more dependent on extensions and newly-built premises. It is gratifying to find that the stock of coke accumulated by the Corporation is nearly cleared away; but we are sorry to say at, comparatively, very low prices. As the South Staffordshire trade increases, this residual will acquire a higher value, and next year the receipts for it will figure in the books of the Corporation for a much greater sum. The necessities of the Corporation gas undertaking require the substitution of one large gasholder in place of several small ones at the Swan Village works. The choice of a site for the new holder has been a matter of some anxiety; for the water in the tank of the gasholder at that place was recently discovered to be rapidly sinking, and it became necessary to work off the gas, and pump out the water. When this had been done, it was found that, owing to mining operations, the floor of the tank had cracked in several places. It will thus be seen that a site for a holder to contain two million feet of gas was a very important matter for consideration. The Corporation have, however, found on land of their own a site where the risks of sinking are reduced to a minimum. It is hardly necessary to say that the water which escaped from the fractured tank ran through the soil in all directions, and polluted a number of wells, for which several demands for compensation have been made on the Corporation. One is of so outrageous a character that the Corporation are perfectly justified in disputing it. As soon as complaints were made, the Corporation arranged to furnish to the complainants, we imagine gratuitously, a supply of water from their premises. A small sum would, therefore, fully compensate a discontented owner or occupier, and most of the complainants have been satisfied with the amounts awarded to them.

The accounts of the gas department of the Doncaster Corporation show very favourable results for the past year. The revenue from gas and meter-rents was £9100, and the net profit amounted to £4480. After paying interest on bonds, &c., and to the Corporation five per cent. on the expended capital, there still remains a balance of £1000, which is transferred to the general account of the Corporation. The progress of the undertaking will be seen from the fact that in 1861 the revenue was £6380, and the interest paid to the Corporation was £289; while in the past year the receipts amounted to £11,782, out of which the sum of £3076 has been paid to the Corporation. We have a strong suspicion that gas might be cheaper in Doncaster, as the Corporation have rich sources of income, to which it is quite unnecessary to add the profits derived from their gas undertaking.

It is not the gas undertaking of every Local Authority that is successful; but, if unsuccessful, it may be safely predicated that the management has been of a strange, not to say extraordinary character. The gas undertaking of the Hindley Local Board affords an illustration. The Board bought the undertaking of the Gas Company, in 1872, for £25,000, and from that day to this they have continued to lose money by it. It is now alleged that when the works were taken over they were in a very bad condition, and £20,000 was immediately needed for improvements. The capital account has been growing ever since, until it now amounts to £52,236, and the loss incurred on the supply of gas is said to have been £4152. In another column will be found the story told before Major H. Tulloch, C.E., who made an inquiry on the application of the Board to borrow a further sum of money. It seems perfectly clear that the Local Board are quite unable to manage their affairs, and that they are very badly assisted by their officers. We shall, no doubt, hear more of this strange business; for there is nothing easier than to make a gas undertaking pay, and we should not express the smallest regret if the members of the Local Board were surcharged the amount they have improperly appropriated.

The Library Committee of the Liverpool Town Council seem to be very well satisfied with the result of their experiment in lighting up the Picton Reading Room by electricity. It is admitted, however, that the effect is not all that could be desired. The lights will flicker, splutter, and hiss, and at the present moment there does not appear to be any effectual way of curbing these eccentricities. We may mention here, in connection with Liverpool, that the electric light has been introduced on board ship, for the illumination of the saloons of large sea-going steamers. The *Mendoza*, which is intended to ply on the west coast of South America, recently came round from Glasgow to Liverpool with the light in operation, and it is esteemed to be a great success. On an ocean-going steamer extra steam power is very cheap. A donkey-engine will drive a Gramme machine, and we can see no obstacle to the successful use of the electric light in the saloons of such vessels, if they can only find a properly constructed lamp that will give a steady light, and make no spluttering. Although we years ago pointed out that gas might easily be made for the illumination of sea-going vessels, we recognize in the electric light a successful rival there, and have no wish to detract from its reported success.

Wallasey Local Board Gas and Water Supply.—At a special meeting of the Wallasey Local Board last Thursday, it was agreed to promote a Bill in the next session of Parliament to obtain power for the Board to extend their gas and water-works, and to purchase land therefor; to revive and extend the time for making a reservoir at New Brighton; and for other purposes—the costs and expenses of such promotion to be defrayed out of the funds or rates under the control of the Board. It was stated that an extension of both the gas and water works was urgently needed.

The Water Supply of Limerick.—At the meeting of the Limerick Corporation on Thursday, the 13th inst., a letter was read from the Secretary of the Limerick Water-Works Company, in which he wrote: "In accordance with a request from Mr. Atkinson, on behalf of the Corporation, that a formal communication should be made to them, I am instructed by the Directors to inform you that, as stated by Mr. Gregory in the course of his examination [at the arbitration already referred to in the Journal] on Tuesday, the 4th inst., they are quite ready, and have been so for many years, to treat with the Corporation for the sale of their undertaking, either by agreement or arbitration; and that they are prepared to consider favourably any reasonable offer which may be made to them by, or on behalf of the Corporation, for such undertaking as it at present stands." Alderman O'Callaghan proposed—"That pending the result of the arbitration, we decline entering into any negotiations with the Water-Works Company for the purchase of their works. At the same time we beg to say that we are of opinion that the water supply of the Company should be in the hands of the Urban Sanitary Board." Dr. O'Sullivan seconded the motion, which was adopted.

Another Use for Gas Tar.—The following letter from Mr. James Howard, of Clapham Park, Bedfordshire, appeared in *The Times* last week:—"To the Editor of *The Times*.—Sir,—Two or three years ago you published a letter from me, in which I gave a receipt for an effective, but non-poisonous dressing for seed corn. The appearance of this letter led to a wide adoption of the plan. Having been frequently applied to of late for information upon the subject, and having adopted some improvements—the result of experience—perhaps you will afford me space for the relation of my present practice. For 8 bushels of wheat, or 6 bushels of barley, take ½-pint of gas-tar, 2 lbs. of blue vitriol, and 2 gallons of boiling water. The tar should be accurately measured (not guessed at), and should be of the consistency of treacle. After the tar is put into a pail, one gallon of the water should be poured upon it, and well stirred. The black, greasy scum which will rise to the surface should be skimmed off with a wisp of straw or piece of sacking, to which it will readily adhere. While this operation is going on, another man should be mixing the vitriol with the other gallon of water. When ready, both lots should be mixed together and poured over the heap of corn, previously shot upon the barn floor. The heap should be well turned over two or three times quickly, so as to saturate the whole. If any tar or dregs remain at the bottom of the pail, they should not be poured on the grain, or it will stick together in lumps, and be likely to clog the drill cups. I have used this dressing for several years with complete success. Not a single boy has been employed to mind the fields, nor has a gun been fired. The full plant, however, whether wheat or barley, has afforded evidence that no loss had accrued. A new bailiff, who wished to save trouble, planted a large field of barley last spring without dressing the seed; but some 200 sable depredators from a rookery hard by gave him a lesson which is not likely to be lost upon him, for, as he remarked to me, the field was a constant source of vexation to him, while, as to the other fields subsequently drilled with dressed corn, he 'could not find the mark of a rook-peck upon them.' I may add that other birds appear to have as great an aversion to the taste of tar as rooks."

Water and Sanitary Notes.

The Gas and Water Committee of the Corporation of the City of London, in obedience to the reference of the Court of Common Council, duly applied to the Home Secretary for an interview; but Mr. Cross declined to see them, on the ground that any action on the part of the Corporation at the present moment would only complicate matters. We may infer from this that the Home Secretary has settled in his own mind the plan he will adopt next session in dealing with the Metropolitan Water Question. When the reference to the Committee was made, we suggested that after Mr. Cross had pledged himself so strongly, both to the House of Commons and to the country, to take up the much-vexed question of the London Water Supply, it was a little indecorous on the part of the Corporation to interfere with his actions. The Common Council have received what we do not care to call a snub, but they have been told not to interfere in the matter until their advice is asked, and we know when that will be. As was pointed out in a recent number, it was possible that the conference of the Committee with the Home Secretary might resemble "interviewing," in the American sense of the word, and Mr. Cross would be "pumped" to ascertain what course he was about to pursue. The Home Secretary is a matter-of-fact man, and not a humourist, or he would have derived some fun from the Gas and Water Committee. We shall not endeavour to anticipate what course the Home Office will pursue. We read in a morning contemporary that the Parliamentary Draftsmen of the Treasury are busy in the preparation of a Bill which is to transfer the management of the Metropolitan Water Companies to a "Water Trust "of some kind or another, not probably that foreshadowed in a parliamentary notice which we commented upon last week. The source of our contemporary's information we do not know; but, as the organ of the beer and spirit trade, it is not likely, we think, to be in the secrets of the Government respecting the Water Question. The matter, we believe, may be safely left in the hands of Mr. Cross. The Water Companies, too, are perfectly able to take care of their own interests.

The report of the Directors and the accounts of the Lambeth Water-Works Company have been issued in anticipation of the ordinary half-yearly meeting to be held this day. The occasion is not without importance. A crisis is impending in Metropolitan water affairs, and we are happy to see that the Lambeth Company are well prepared for whatever may happen. In the first place, the Company have faithfully fulfilled all their public duties. They supply water purified by long subsidence and perfect filtration, and they are quite willing to extend as rapidly as possible a constant supply with hydrants all over their limits. We are somewhat astonished to see that the Metropolitan Board of Works are at last moving in this matter. They have stood aloof so long as to fall into merited discredit. Now we may hope that hydrants and the constant supply system will be universal all over the Board's limits. But for this we shall not have to thank the Metropolitan Board, who sulkily stood aside while Companies like the Kent, the New River, the East London, and others, were endeavouring to carry out the provisions of the Metropolis Water Act of 1871, which it was the especial duty of the Metropolitan Board to promote. They are now roused, as we have said, into something like activity; but it is too late. We fancy that they will discover, in a very few months, that any pretensions to a control over the Metropolitan Water Supply will have vanished from their grasp. We cannot help thinking that the Act of 1871 afforded the Board an opportunity, but they shrank from incurring the odium which might have ensued from the carrying out of the regulations of the Board of Trade. But to return to the Lambeth Company. The accounts show that a net profit of £44,549 was made during the half year to Sept. 30, which, after the payment of interest, leaves the sum of £40,334 applicable to dividends. This admits of the payment of six and a half per cent.—the highest dividend, we believe, the Lambeth Company have ever paid. They are very properly calling up their capital. The last instalment of £15 per cent. on certain whole, half, and quarter shares is made payable on the 1st of December next. The Directors intend to issue about £118,000 of new share capital, which will be entitled to a dividend of ten per cent., and will be offered and distributed *pro ratâ* amongst existing Proprietors. The business of the Company naturally and necessarily progresses. Parts of their district are being rapidly built over, and mains which once passed through sparsely populated places are now being tapped to supply a large population. During last half year the Company laid 1593 new services, which are estimated eventually to yield an annual rental of £4117. A Company in this position are entitled to much consideration from the Government. We will not say more consideration than any other of the Metropolitan Water Companies, who have equally well fulfilled their duties to the public, and have, as the Directors of the Lambeth Company put it in their report, in all cases sought to levy rates, under their parliamentary powers, in a reasonable and equitable manner.

It is impossible to refer to all the various reports of sewerage difficulties which are brought under our notice. We may mention, however, East and West Looe, situated in a remote district in Cornwall, where the sanitary conditions under which the inhabitants live are as bad as they can possibly be. Dirty narrow streets, with the houses imperfectly furnished with water or closets, or any other decent conveniences, are thickly inhabited by people who carry out their refuse after twilight, and throw it into the sea. This is not a matter for us to comment upon; but looking over, as we do, the whole of the country, we feel bound to say that the drainage of East and West Looe requires the attention of the Local Board, and the interference of the Central Authority. Such matters as these should be settled by the Local Authorities concerned, without the smallest difficulty or trouble; but they will not settle them, and until influence is brought to bear upon them by some Central Authority, they will go on and act exactly as they please, always looking at the rates, but never at the comfort and convenience of the ratepayers. Now, we are the firmest friends of local self-government, but we may say, once and for all, that the proceedings of these wretched Vestries and Local Boards are not to be tolerated. We have pointed out over and over again, that nothing effective would be done for the drainage and water supply of England, until the whole country was mapped out into drainage and watershed areas. If this had been done in Cornwall, and the work had been carried out by a strong Central Authority, all the disorders which now pervade the district, when water supply and drainage schemes are discussed, would long ago have ceased. There is one thing that can be done, and that is for six responsible ratepayers to make application to the Local Government Board, and bring down an Inspector, whose instructions must be fully carried out. Local self-government is, in many cases, a simple blunder. The people who are brought into authority are commonly the most ignorant and selfish in the locality, and the sole thing which brings them into power is the wealth which they have amassed by their selfishness. Let us have, for the regulation of sanitary matters, an honest despotism; but, in any other case, we must leave such people as constitute the Local Authority of East and West Looe to do what they can.

GAS LEGISLATION FOR 1879.

(*Continued from p.* 773.)

The following Acts, for the most part, authorize the purchase of gas undertakings by local authorities, or confer further powers upon local bodies already in possession of gas undertakings. It will be seen that some Acts are introduced in this section which do not properly come into our classification, but the collocation is unavoidable.

The *Birmingham Gas* (*Northfield and Yardley*) *Act* scarcely comes within the scope of the Acts with which we are now dealing. It is simply to repeal a section in the Birmingham Gas Act, 1875, carried over from the Birmingham and Staffordshire Gas Act, 1864, which allowed a differential charge for gas to be made in the Northfield, Yardley, and Solihull districts, of 1s. per thousand feet beyond that charged in the borough.

The *Blackburn Improvement Act* extends the limits of the Corporation, so as to include a portion of the township of Lower Darwen and that portion of Little Harwood which was not until now included in the district of the borough. The Corporation have power to borrow £30,000 for the improvement and extension of their gas-works, and the sum is to be paid off in the usual manner by means of a sinking-fund, the customary returns being made to the Local Government Board.

The *Blackpool Improvement Act* is to extend the borough so as to include some surrounding townships. It further empowers the Corporation to borrow £36,000 for extending and improving their gas-works, and also to employ the electric light for the illumination of the promenade and other places of public resort, but for no other purpose, for a period of five years. The expenses of the light are to be chargeable to the district-rate, and whatever profit may be derived is to be carried to the credit of that rate. The Act gives the Corpora-

tion power to acquire lands upon which to erect workshops, engine-houses, and storehouses (including places for *storing* electricity for producing light). Before laying wires for the conveyance of electricity, the Corporation must give fourteen days notice to the Postmaster-General, and conform to any reasonable regulations he may see fit to impose. The Act further authorizes the Corporation to manufacture residual products. The maximum charge for gas is fixed at 4s. 6d. per thousand feet, and it is to be supplied at the usual day and night pressures.

The *Goole Gas Act* authorizes the Undertakers of the Rivers Aire and Calder Navigation to make better provision for the supply of gas to the port and town of Goole. About the year 1839 the Undertakers, at their own expense, first commenced supplying gas to the port and town of Goole. Since then the town has increased in size and importance, and further demands are made for gas. The Undertakers have expended £22,000 upon the works, and have now obtained power to raise a further sum of £20,000, to be called additional capital. On the original capital they have power to pay a dividend of ten per cent., and on the additional five per cent., it being understood that if larger profits are available they may be used in paying back dividends. Gas of fourteen-candle power is to be supplied, tested at the works by Sugg's "London" Argand burner, No. 1. The maximum price is to be 5s. per thousand feet. Of course, in this case no mention is made of auction clauses or sliding scale. The usual day and night pressures are prescribed.

The *Liverpool Lighting Act* authorizes the Corporation of Liverpool to borrow £50,000, to "experiment" with the electric light. The time allowed for the repayment of the loan is ten years, and it may be made by means of a sinking-fund, or by equal annual instalments. The experiments of the Corporation may continue over a period of five years from the passing of the Act, after which the privilege appears to lapse. It is provided that the light, to whomsoever furnished, is to be supplied without profit—a fact which makes us hope that in time we shall know its exact cost. The Act further gives the Corporation power to erect and maintain any necessary workshops, engine-houses, storehouses (including places for *storing* electricity for producing light). It is, of course, understood that the Corporation are allowed to utilize the light in or upon any of their own property. Our readers know that they are doing this at the present time; but the question as to when they will take their wires to the Imperial Hotel and the Railway Station is a doubtful one. In the Bill originally promoted, power was sought to take over the undertaking of the Liverpool United Gas Company; but in the Act it is provided that nothing contained therein shall authorize the Corporation to "manufacture, sell, or supply "gas." It is to be remarked that the Act gives no exclusive powers to the Corporation, for it is provided that any person, corporation, or company may produce the electric light for use on any premises owned or occupied by them, which they could have lawfully done if this Act had not been passed. A clause is inserted for the protection of the Postmaster-General.

The *Nottingham Corporation Act* authorizes the Corporation to acquire about twenty acres of land upon which to construct additional works for the manufacture and storeage of gas and residual products. Power is also given to the Corporation to produce and supply electric light for a period of five years, for the lighting of streets and places of public resort, but for no other purpose. They may erect workshops, engine-houses, and places for *storing* electricity. The usual fourteen days notice of the intention to lay wires must be given to the Postmaster-General. The Corporation have power to borrow such sums of money as they may require for the purpose of electric lighting.

The *Over Darwen Improvement Act* is to extend the limits of the borough so as to include a portion of Lower Darwen and Eccleshill. Lower Darwen has hitherto been supplied with gas by the Blackburn Corporation; but Over Darwen now takes over the gas plant, in consideration of the sum of £12,626 6s., with results which were shown in our last issue. The Corporation have obtained power to supply the electric light for a period of five years to their own buildings, places of worship, theatres, and generally to places of public resort, the charges for which are to be settled by agreement. The Corporation have power to charge all expenses to the district-fund, to which all profits are to be carried. The customary fourteen days notice of the intention to lay wires is to be given to the Postmaster-General.

The *Rawmarsh Local Board Act* authorizes the Board to purchase so much of the gas plant of the Corporation of Rotherham as lies within the Board's limits, and to manufacture and supply gas in the district. The consideration is to be fixed by arbitration. The price charged for gas varies according to the quantity consumed, the lowest being 3s. per thousand feet for a consumption of 44,500 feet and upwards. The quality of the gas to be supplied is not specified, but fourteen candles was put down in the Bill.

The *Stratford-upon-Avon Borough Act* is, among other things, to transfer the undertaking of the Stratford-upon-Avon Gas Company to the Corporation of the borough. The consideration to be paid is either annuities representing maximum dividends, or a lump sum equal to twenty-five years purchase of such dividends. Gas of the illuminating power of fourteen candles is to be supplied, tested by Sugg's new "London" Argand burner, No. 1. The price is not to exceed 5s. 6d. per thousand feet. The usual day and night pressures are prescribed. The Corporation are empowered to manufacture, sell, and let on hire meters, fittings, &c. The Act requires the Corporation to sell to such Urban Sanitary Authorities as may hereafter be constituted in their limits, those portions of their plant that lie within the limits of the district of the newly-constituted Authority.

The *Tipton Local Board Act* is to authorize the Board to acquire lands on which to erect and maintain gas-works. It will be remembered that the Board have already purchased so much of the gas plant of the Birmingham Corporation as lies within their limits.

The *Warrington Lighting and Improvement Act* authorizes the Corporation to construct additional gas-works. The Corporation purchased the undertaking of the Warrington Gaslight and Coke Company in 1877. But the demand for gas seems to have outstripped the capacity of the works the Corporation took over from the Company, and consequently they have sought and obtained power to construct new works on a plot of land, described in a schedule, to be acquired by agreement. On this land they have power to erect and maintain works for the manufacture and storeage of gas, and for the storeage of all kinds of residual products. Power is given to the Corporation to supply within their limits gas for heating as well as lighting purposes, and to manufacture, sell, and let on hire all stoves, &c., necessary for the use of gas for such purposes. The Corporation have acquired general powers to hold patent licences, but not to be in any case exclusive. Power is given to borrow for gas purposes £20,000 upon the security of the gas revenue and borough fund, which sum is to be repaid by means of a sinking-fund, the usual returns being made to the Local Government Board.

The *Wombwell Local Board Act* is to confirm an agreement entered into between the Local Board and the Wombwell and Darfield Gas Company for the purchase of their undertaking. The Company were formed in 1869, and duly registered under the Companies Act, 1862, to supply gas in the townships of Wombwell and Darfield. They have expended on works the sum of £4000, and now part with them for £8000 and two sums of £200, being five per cent. interest on the first-named sum for two years. Besides the undertaking of the Company above mentioned, the Local Board have arranged to purchase, for the sum of £500, such part of the plant of the Elsecar, Hoyland, and Wentworth Gas Company as lies within the district of the Board. For these purchases, and for the carrying on of the undertaking, the Board have acquired power to borrow on mortgage a sum not exceeding £14,000, except with the consent of the Local Government Board. The Local Board are to supply gas of an illuminating power of fourteen candles, tested by Sugg's "London" Argand burner, No. 1, at the usual day and night pressures. The price is not to exceed 5s. 10d. per thousand feet in Wombwell, and 6s. 3d. in Darfield. Interest on consumers deposits is to be at the rate of four per cent. only.

WATER LEGISLATION FOR 1879.

THE following Acts incorporate Water Companies hitherto without statutory authority, or confer additional powers upon Companies already incorporated:—

The *Colwyn Bay Water Act* incorporates the Colwyn Bay and Pwllycrochon Estate Company, Limited, who have hitherto supplied the district with water. The original capital of the Company is by this Act fixed at £9000, and the additional at £6000; but the entire capital of the Limited Company was £100,000. By this Act the Company have power to borrow £2250 in respect of the original capital, and £1500 on the additional. The dividends on the new capital are limited to seven or six per cent., according as it is raised as preference or ordinary. The Company's limits include a portion of the parish of Llandrillo-yn-Rhos. The charge for a domestic supply of water is to be seven and a

half per cent. on the annual rack-rent, with the usual extra charges for a bath and water-closets more than one. The Company take power to supply water by meter, at the rate of 2s. per thousand gallons.

The *Grand Junction Water-Works Act* is only to revive certain powers of voting, conferred by the Act of 1811, but repealed by inadvertence in 1878.

The *New River Company's Water Act* authorizes the Company to raise further capital to the amount of £500,000, to be raised by debentures, to bear interest at the rate of four per cent. These debentures will rank next to those issued, or about to be, under the Company's Act of 1857.

The *Nottingham Water Act* extends the limits of the Nottingham Water-Works Company so as to include several parishes beyond their previous limits, and also to add to their works. The Company were incorporated in 1845, and under subsequent Acts their limits have been largely extended, good service thus being done to Nottingham and the surrounding neighbourhood. These powers, however, will not avail the Company, for, by the Nottingham Corporation Act, power is given to the Corporation to buy, and the Company to sell their undertaking, which will pass into the hands of the Corporation on the 26th of March, 1880. The consideration to be paid for the undertaking is as follows:—In the first place, the Corporation pay £10,000, and collect the water-rents due to the end of the financial year, March 25, 1880. In the next place, the Corporation pay a lump sum of £20,000, for the expenses of winding up the Company, compensation of officers, &c. Thereafter the Corporation are to pay annuities, commencing with six and a half per cent. for 1881, six and three-quarters per cent. for 1882, and seven per cent. for 1883 and subsequent years. All these annuities may be redeemed at twenty-five years purchase. Power is given to the Corporation to supply water in bulk, and to sell portions of their undertaking to Rural Sanitary Authorities within their limits. Authority is also given to borrow £900,000 for water purposes, which is to be paid off by means of a sinking-fund to be commenced five years after the passing of the Act, the whole amount to be repaid in seventy years. The usual returns are to be made to the Local Government Board.

The *Sleaford Water Act* is to incorporate a Company with power to supply the town of Sleaford and the neighbourhood with water. The capital of the Company is to be £6000 in £10 shares, with power to borrow £1500 when all the capital has been issued and accepted. The water-rates for domestic supply are about as usual, and extras also. Water supplied by meter may be charged for by agreement.

The *Southend Water Act* incorporates a Company who in 1871 obtained a Provisional Order, which is by this Act repealed. The capital was £20,000 in £10 shares, all of which has been raised and expended, and the Company have no mortgage debt. By this Act the capital is fixed at £80,000, the £20,000 already raised being called original, and the remaining £60,000 additional capital. The customary borrowing powers are granted in respect of both classes of capital. The limits of the Company include the town of Southend and several surrounding parishes and townships. The usual rates and extras may be charged.

The *Weardale and Shildon District Water Act* authorizes the Weardale and Shildon Water-Works Company to raise further capital, construct additional works, and purchase the undertaking of the Durham Water Company. The Weardale and Shildon Company were incorporated in 1866 with a capital of £150,000, and with power to borrow £37,500. By a subsequent Act passed in 1875 the limits of the Company were enlarged, and power was given to raise additional capital to the amount of £600,000, and to borrow to the usual extent. This Act authorizes the Company to absorb the Durham Water Company, who would, against all remonstrance, pump water from the River Wear. The capital of this Company was £32,500, and they had not borrowed any money. The consideration for the purchase of the Durham Company is to be the issue of 1600 shares of £25 each, fully paid up, which is just about double the capital of the Company. The Act also gives the Weardale and Shildon Company power to raise a further sum of £100,000, carrying the ordinary borrowing powers.

(To be continued.)

Society of Arts.—The first meeting of the one hundred and twenty-sixth session of this Society was held last Wednesday, when an opening address was delivered by Lord Alfred S. Churchill, Chairman of the Council; and at its conclusion, he presented the medals and prizes awarded for papers, &c., read during the past session. Among the recipients of medals were Dr. Wallace, F.R.S.E., for his paper on "Gas Illumination;" and Messrs. F. Toplis and J. Lucas, for their papers containing suggestions as to the best means of dividing England and Wales into districts for the supply of pure water.

Communicated Article.

THE UTILITY OF WATER FILTERS.

By "Isca."

From time to time considerable stir is made in scientific and popular papers, and at sanitary meetings, as to the filtration of water intended for culinary and dietetic purposes, and the advisability or necessity of the universal adoption of house filters is strenuously insisted on by some persons, and as firmly denied by others. Imputations on the purity of the water supplied by the London Companies, and by others in the country, are very easily uttered and believed by such of the public as are profoundly ignorant of the process by which it is cleansed before being sent into the street-mains; while another section cannot bring themselves to think that the great expanses of sand and gravel, which they know are denominated filter-beds, at large water-works, can have much effect on the water which passes through them. The idea that sand is dirt, is probably fixed in the minds of many people, and they will not allow that any quantity of it can possibly have an equal effect to that of the neat-looking apparatus which is fitted up with bits of sponge, blocks of carbon or spongy iron, or other patent material, for household use. At the late Social Science Congress, at Manchester, the utility of domestic filters was rudely challenged by several speakers, and there can be little doubt that the article referred to is too frequently regarded as a kind of conjuring apparatus which will go on yielding, to an indefinite extent, pure water for dirty, without receiving a tithe of the cleansing and attention which is bestowed on the rude sand-beds of water-works.

Remarks have not been wanting to the effect that water companies ought to adopt some means of filtration, other than the contemned sand-and-gravel beds, and this seems to have been a cry which has met with considerable favour at Hamburg, where a proposal has been made to adopt a system devised by Dr. Gerson, and stated by him to be applicable to primary as well as house filtration. The proposition appears to have attained such importance, that Mr. Grahn, of Essen, was led to make a thorough inquiry into it, and into the relative advantages of sand-and-gravel filtration, and filtration by other materials, with especial reference to the chemical action claimed for some of the latter. His paper on the results of his inquiries was read at the meeting of the German Gas and Water Managers Association, held in June last, and recently printed in the *Journal für Gasbeleuchtung*, and contains matter of great interest, affecting both the health and pockets of consumers of water supplied by public corporations, who, terrified by the dismal pictures drawn by crotchet-mongers of the state of the towns water, frequently fall victims to sanitary quackery, and purchase costly filters, the best of which are really no more efficient than a common flower-pot filled with sand and gravel, while the worst are infinitely lower in the scale of utility.

Mr. Grahn says: At the end of last year Dr. Gerson published a pamphlet on the water supply of Hamburg, in which he condemned the proposal of the Town Council to establish sand filter-beds. In place of these he recommended his own system, which, however, he did not advocate for Hamburg, on account of the dirty condition of the mains; but he advised the general use of house filters. It could scarcely happen that the water selected to supply a town would be such as to require house filtration in order to be wholesome. No public corporation would undertake the responsibility of cleaning and inspecting house filters; so that the control of the water as regards filtration will always remain with the town authorities, and be conducted in bulk. This is but right; the danger, however, lies in the fact that those who have the direction of these matters are generally untrained persons, and as such are apt to listen to mischievous proposals, the purport of which they are unable to understand.

Mr. Gerson's system is briefly as follows:—The water first passes through a filter, in which it is freed from inorganic substances and bulky organic matters, and, if intended for dietetic purposes, then passes into a special apparatus calculated to remove organic impurities in the most complete manner possible. In the first filter are placed sponges prepared with iron solution and pumice stone; the second filter contains tightly-packed Swedish iron ore, layers of sand of different degrees of fineness, or, instead of this, broken glass, and wool and pumice-stone prepared with iron solution. Animal charcoal may also be used instead of pumice. This description is taken from the specification of the patent; other papers respecting the filters do not mention wool or animal charcoal, and name a certain kind of Swedish iron ore as a cheap substitute for Bischoff's spongy iron. The first filter is only to work under high pressure, and, therefore, in closed vessels; the second is to work in open vessels, and is then to be used in primary filtration, or in closed vessels under high pressure, for domestic filters. Thus there is nothing new in Dr. Gerson's list of materials, Spencer's magneto-proto-carbide of iron being similar to Swedish iron ore. The only novelty is in dividing the material into two receptacles. Some novelty is also to be found in the arrangement for cleaning the first filter. The lower sieve, which carries the sponges, is capable of being raised or lowered by means of a rod, which protrudes through a stuffing-box, whereby the sponges can be squeezed out; and the sides of the second filter are lined with the same material which is used for filtration, in order to prevent any water passing through without coming in contact with the material.

When considering this description of filter with respect to primary filtration in bulk, the first thing to be settled is as to whether it fulfils the requirements of quantity and quality. According to the inventor, the first filter is able to purify in 24 hours from 500 to 600

cubic mètres of water per square mètre of surface, with a loss of head equal to one-fifth or one-fourth of atmospheric pressure. The action of the first filter is purely mechanical, and the pores of the material must, therefore, retain the eliminated dirt. The smaller they are the more efficiently this will be done, but they will then also be the sooner choked, and the filter will have to be the more often cleaned. According to Kümmel, the filter for the Elbe water, at Altona, has to be cleaned when 35 to 40 cubic mètres of water have passed through every square mètre of filter surface. If the Gerson filter be as effective for mechanical cleansing as the sand filter, its pores must be of the same size, and consequently it must be cleaned after having filtered an equal quantity of water. Supposing that a square mètre of filter surface really filters 500 to 600 cubic mètres of water per 24 hours, then the filter should be cleaned from 12 to 18 times every 24 hours; that is to say, once in every 1½ or 2 hours. For filtering in bulk 10,000 cubic mètres daily, the inventor proposes twelve primary filters in two rows, each filter having a superficies of about 2 mètres. Supposing five filters in each row to be in use, while the others are being cleaned, a filter would require cleaning every 16 or 24 minutes. It is probable that the sponges would soon lose their elasticity under this treatment, and therefore be subject to an alteration in volume, the effect of which would appear in the work done by them. Any one acquainted with the nature of the dirt mechanically separated from water will know that it would be best cleaned off by a stream of that fluid. Hence it is evident that the proportion which the quantity of water necessary to clean the filter has to the quantity filtered by it is of great economic interest, as bearing on the net quantity of work done. The function of the pumice in these primary filters is not quite clear. Is it intended to retain the dirt which passes through the sponges, and are the sponges thus to act as strainers for the pumice, or is it to act similarly to the gravel of the ordinary sand filter—*i.e.*, to prevent small pieces of sponge, &c., being washed away?

The secondary filters are intended to be contained in brick or iron tanks. Their superficies, however, is to be 30 to 35 times less, and the layers of material only half as thick as in sand filters. The filtration thus occupies from 1-30th to 1-35th of the time of sand filtration, and the water is only in contact with the material 1-60th or 1-70th of the time. In house filters, when the secondary arrangement is fixed on a high-pressure service, the work is said to be performed in 1-200th of the time necessary with sand. In these secondary filters there is a quantity of sand or glass, and pumice, which act mechanically, and a small portion only of the filtering material consists of iron ore, to which the chemical effect is to be ascribed. If the iron ore be 0·5 mètre in thickness, and its granules be spheres of equal diameter, then the proportion of intermediate space to the entire area, independently of the diameter of the grains, is—

$$\frac{r^2\left(\sqrt{3}-\frac{\pi}{2}\right)}{r^2\sqrt{3}} = \frac{1732-1571}{1732} = \frac{161}{1732} = \cdot 09$$

In every hour, by every superficial mètre, 2·5 cubic mètres of water have to be filtered, and the interstices amount to 0·09 square mètre for every mètre of filter surface; hence the water passes through a space of 0·5 mètre in 1 min. 4·2 sec. Although this calculation makes no pretensions to great accuracy, it gives a good idea of the time during which the iron and water are in contact with each other. As this time is so short, and the substances to be acted upon are diffused very minutely through the water, a very strong chemical affinity between the two elements would be necessary, in order that the chemical process should go on throughout the whole. As the inventor considers the iron ore only in the light of a cheap substitute for Bischoff's spongy iron, it is only reasonable to suppose that the substitute is about as effective as the original, though certainly not more so.

Mr. Bischoff's spongy iron has been subjected to thorough examination from several points. Besides the exertions of the inventor himself, who has made his material the subject of much writing and public speaking, spongy iron was warmly recommended by Dr. Frankland in the Sixth Report of the Rivers Pollution Commission. Still, Dr. Frankland expressly states: "We wish it to be clearly understood that although this filtration of water polluted by excreta appears to provide a protection against epidemics, there is no reliable evidence, based on actual experiment, to confirm this opinion." Thus under all possible reserves! Later experiments upon spongy iron, by Dr. Lewin, of Munich, have given results differing widely from those of Dr. Frankland. Dr. Lewin requires a filtering material to possess the following qualities:—"It must absorb not only matter in suspension, but also substances physically and chemically latent, and must so retain them that additional impure or clean water cannot wash them out, or else they must only be carried on in a form which cannot influence the purity of the water. Of course it is essential that the material should retain these properties for some time without deteriorating." We may consent to the utility of these requirements, but at the same time we must own with Dr. Lewin, that such a style of filtration does not exist, either artificially or in nature. The ordinary sand filter is capable of mechanically retaining suspended matter by its capillary system, and of removing such dissolved impurities as are susceptible of mere surface attraction, and these intercepted matters are not liable to be washed out again, because when the capillary passages become filled with matter, the further ingress of water is not possible. Thus we see that the filtering material must be fine enough to be filled up, and the pressure on the filter must not thereby be so increased that the choked orifices become liable to be broken through.

Since the discovery of Figuier in 1811, another effect has been generally ascribed to charcoal, and especially animal charcoal. It has great power of absorption, but is also capable of saturation. The experiment of Edward Byrne (Institution of Civil Engineers, May 21, 1867) deserves mention. He filled a common earthenware filter with 5 lbs. of newly-burnt animal charcoal, such as is commonly in use in sugar refineries, and passed through it water containing 88·30 parts of inorganic, and 10·80 parts of organic matter. The first gallon filtered lost 52·60 parts of inorganic, and 4·80 parts of organic matter. This effect became less with succeeding trials. The sixth gallon showed no loss in the proportion of organic matter, and the seventh and following gallons filtered showed a sensible increase of this kind of impurity, which increase amounted to 1·55 parts in the fifteenth gallon. Of the whole 13·48 parts of organic matter removed by the filter from the first six gallons, 4·98 parts were dissolved out by the following six gallons. At the twelfth gallon the loss of inorganic matter was only 8·8 parts, as against 52·60 parts in the beginning. It has further been proved, especially by the experiments of Dr. De Chaumont, that a low organic life is speedily developed in water which has been filtered through charcoal, even when analyses taken immediately subsequent to filtration fail to show a trace of organic impurity; and that the same effect is produced in water by long contact with charcoal. Charcoal in small pieces produces the effect on the water by a contact of four minutes; large pieces take longer. Dr. J. Müller has even proved that spores of low organisms pass through compressed charcoal filters. The latest experiments with the charcoal filter commonly used in many parts of America, published by Professor Ripley Nichols, of Boston, Mass. (Tenth Report of the Massachusetts State Board of Health), have also proved its entire inefficiency. The water in these filters first passes through sponge, and then through gravel and charcoal. The smallest of these filters weighs 150 lbs., so that there is certainly enough material in them. The experiments have been repeated during many months, and no alteration has been discovered in the amount of organic impurity. When the sponge had been recently washed, a slight alteration in the water was observed; but it only lasted a very short time, and only affected the quantity of matter in suspension.

If charcoal can by no means be considered proper filtering material in cases where the operation is not subject to special control, iron, in its various forms, is certainly not more suitable, as Dr. Lewin's experiments have most clearly proved. According to Dr. Lewin, Medlock was one of the first who caused iron to be used for purifying water from organic matter. He proposed to suspend in the water to be treated bundles of iron wire of about 1·5 mm. diameter, 1 kilo. of wire to 10 cubic mètres of water. He imagined that the ammonia of the organic matter would, by oxidation, change into nitric acid, and that this acid would combine with the iron. Now, the experiments of Dr. Calvert (*Comptes Rendus*, Vol. LX., p. 453) have shown that metallic iron is not affected by water containing no gas, or in dry carbonic acid. The oxidation of iron requires the presence of oxygen or damp carbonic acid, both of which, with iron, create electrical currents, and thereby cause the decomposition of the water. In open water-tanks, hydrated peroxide of iron is thus formed, without the removal of the oxygen of the organic substances present. According to Hofmann ("Water Supply of Leipsic," p. 32), this hydrated peroxide of iron will, in time, part with some of its oxygen to decaying substances, and change into soluble ferric-protoxide-carbonate. Decaying matter and time are thus necessary for the due action of hydrated peroxide of iron. Lewin had dilute urine in contact with hydrated peroxide of iron for six days without any nitric acid being formed. The urine underwent the same changes as would have occurred had the iron been absent. He thinks the time required for organic substances to be acted upon by iron is so long "that families who might decide to wait until their foul water supply should be purified by iron would certainly perish for want of water."

Runze supposes that metallic iron absorbs the oxygen contained in water for its oxidation, and thereby producing water free from oxygen, preserves from decay organic substances present in it. It may be pointed out that the worst water from tanneries, &c., only contains traces of oxygen, but is most favourable for fungi. I will not consider the different explanations given by Spencer as to the action of his "magnetic carbide," or by Bischoff as to his "spongy iron," but examine the results of the experiments made by Lewin with one of Bischoff's filters, with a view to obtain practical evidence of its working. He filtered a fluid which contained a certain amount of nitrogen, and noted the loss of nitrogen by the filtrate, and then passed clean water through the filter, in order to ascertain the quantity of nitrogen taken up by it. During the first three days experiment, 2 litres of urine, containing 16·325 grammes of nitrogen and 40 grammes of other impurity, were filtered, and the filtrate contained 4·2525 grammes of nitrogen and 10·615 grammes of refuse. By pouring 7·5 litres of pure water into the filter, a fluid was obtained containing 15·816 grammes of nitrogen and 39·821 grammes of refuse; 0·508 gramme, or 3 per cent. of the nitrogen, was thus missing, also 0·179 gramme, or 4 per cent. of the refuse, which either remained in the filter or was lost. In a second experiment, which lasted four days, 4 litres of urine with 24·71 grammes of nitrogen and 48·5 grammes of refuse were filtered, and by afterwards passing 5 litres of water, 24·3018 grammes of nitrogen and 49·9 grammes of dry refuse were washed out. The total amount of missing nitrogen was thus 0·41 gramme, or 1·6 per cent., and the residue had increased by 1·4 grammes, as the washing was done with water from the town mains. In the filtrates, neither nitrates, nitrites, nor ammonia were found. The result of an experiment with 80 cubic centimètres of glair in a glass tube, filled with spongy iron, was a loss of 2·7 per cent. of nitrogen. In order to further examine the action alleged by Bischoff to be exerted by spongy iron in decreasing the carbon of

organic substances, Dr. Lewin filtered milk serum containing chloride of sodium, and on subsequent washing he found 2·9 per cent. of sugar and 0·1 per cent. of chloride of sodium missing. As the experiments lasted over three days, there is no room for the objection that there was not sufficient time for the spongy iron to act, especially as the quantity filtered was only 4 litres.

The conclusion drawn by Dr. Lewin from these experiments was that, in ordinary filtration, spongy iron has no chemical action on organic substances, containing nitrogen or otherwise, for the insignificant loss shown by the washings would probably be recovered with prolonged treatment, or it may be attributed to unavoidable error in estimation. Nicholls endeavours to explain the inertness of the spongy iron in these instances as due to the concentration of the fluids used. The reason for this is not very evident. From experiments made according to Dr. Frankland's and Professor Wanklyn's methods, he concludes that though the filtering material may have some effect on water not containing any considerable quantities of organic matter, yet the supply must be regulated so as to allow the passage of only very small quantities in a fixed time, "so small, indeed, as to seriously interfere with the general use of the filters." The writer of the paper regretted that he had not been able to examine a Gerson's filter in the same way. As he himself, however, only considered his material in the light of a cheap substitute for spongy iron, Mr. Grahn had no doubt that similar experiments would have led to like results.

From experiments made with iron and silicated carbon filters by Mr. G. W. Wigner, who tested both kinds in combination, filtering through carbon first and then through iron, and *vice versâ*, it appears that no change at all, or very little, is caused in the nitrogenous ingredients of water, by contact with either silicated carbon or iron, as used in domestic filtration, even when a minimum of water is treated—*i.e.*, when contact between the water and the filtering material is maintained as long as possible. Hence the amount of such chemical action when filters are in ordinary use may be imagined. The action, never present except at the commencement, soon ceases, and the material thenceforward acts only mechanically in removing suspended bodies, for which purpose there exist cheaper and more efficient materials. The case is similar with other materials considered valuable from their chemical action. Dr. Lewin says that it is only through the scarcity of published reliable experimental results, or popular ignorance of them, that it has been possible for inventors of filters to spread the most wonderful reports concerning the power of their wares. The public are kept informed only of such experiments as favour the inventors, who are also allowed to pass their own judgment on the purity of the filtered water. It is only too easy for these gentlemen to gain the public ear, especially by reason of the tendency of sanitary enthusiasts and guardians of the public health to continually dwell upon the injurious effect of organic matter in water, and, in spite of Pettenkofer and other investigators, never tire of ascribing typhus, cholera, and other horrors, to such water, and constantly spread the notion that closing wells will put an end to epidemics. Their pattern is Dr. Frankland, who always seeks to explain trifling changes in the mortality of London as due to small differences in the constituents of water, as shown by his analyses; as, for instance, when he describes everything in water as so much dirt, and translates his quantities, for the sake of greater significance, into expressions of pounds of sewage in a cubic mètre. His logical mind leads him also into other particular assertions, such as that a certain water would make every epidemic disease impossible.

In Germany there has been appointed by the Society of Public Health a Commission, which was to ascertain "What are the dangerous impurities in water, and how they should be discovered?" The report has not appeared, first because of the illness of the reporter, and now, it is said, because the result would be negative. Although a true scientific standard in the discussion has not yet been agreed on, opposite sides have been taken by scientific men—Varrentrap, Reichard, Fischer, Wolfhügel on one side, and Pettenkofer, Sander, Nägeli, Wiebel, and Lewin on the other. No one would prefer dirty water to clean; every one would avoid water which is polluted, perhaps with excreta, even if there should be no direct proofs forthcoming of its dangerous character. If dirty-looking water must be used, it would be certainly filtered, if only for æsthetic reasons. But it is not right to condemn all water as unfit for use because it might require filtering to be made perfectly clear. As sand filtration has always led to satisfactory results wherever it has been skilfully planned and carefully looked after, and as no other equally efficient and practicable material exists, and as it must be owned, on close examination, that Gerson's method, and David's method likewise, are impracticable, it is difficult to understand why the people of Hamburg have not rejected Gerson's proposals. In the hope that similar trifling with important matters may not occur elsewhere, has Mr. Grahn's paper been written.

SALFORD SEWAGE WORKS.—Important sewage works are at present being constructed by the Salford Corporation, who have taken the initiative in providing a method of dealing with their sewage other than by turning it into the River Irwell, which at present is made the outfall for the district through which it passes. An entirely new system of sewerage for the borough is now almost completed, and when the other works in connection with this new system are carried out the sewage will be dealt with by precipitation. In the outskirts of the borough large precipitating tanks are being constructed, which it is expected will be in operation by the close of next year, and for raising the sewage at the outfall, of which, when the works are completed, there will be 12 million gallons to deal with daily, a pair of combined vertical pumping-engines, each of 160 effective horse power, are to be erected. The works have also been so designed by the Engineer, Mr. A. Jacob, that the effluent water from the tanks will drive a pair of turbines which will actuate the machinery in the mixing-house, and thus turn the fall of the sewage to useful account.—*Engineer.*

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

THE REMOVAL OF TAR FROM THE HYDRAULIC MAIN.

SIR,—My attention has been called to a letter from Mr. Key, of the Tradeston Gas-Works, Glasgow, in your issue of the 11th inst., which I did not observe at the time, and in which he claims to have invented an apparatus for drawing off the tar and regulating the water level in the hydraulic main. It appears to be a not uncommon thing for an invention to be reproduced as new and original by some one, many years after the same has been made known to the public. The above seems to be a case in point.

In 1863, I read a paper, illustrated by drawings, before the Royal Scottish Society of Arts, in Edinburgh, descriptive of my improvement for effecting the same purpose, which is by means of a bent pipe from the under side of the hydraulic main, rising up outside to the desired level, and a similar pipe from the upper side of the main, both meeting in the T-piece, to which an ordinary underground sluice-valve is applied to raise or lower the water level as desired. I read the same paper to the North British Association of Gas Managers, at their annual meeting held that year in Broughty Ferry. Extracts from this paper were in both instances published in the local newspapers, as also in the JOURNAL and in the *American Gaslight Journal* of Oct., 1863, which latter journal requested to be furnished with a copy of the paper, that they might print it in full. It appeared in full in the "Transactions of the Royal Scottish Society of Arts for 1863," Vol. VI., part III., and I was awarded the Society's silver medal for it, which I received at the hands of His Royal Highness Prince Alfred.

These facts speak for themselves.

THOMAS WHIMSTER.

Perth Gas-Works, Nov. 22, 1879.

THE LIGHTING OF THE STREETS OF LONDON IN THE EIGHTEENTH CENTURY.

SIR,—In my reading the other day I came across the following, which you may consider of sufficient interest for insertion in the JOURNAL.

GEORGE ANDERSON.

35A, *Great George Street, Westminster, Nov.* 18, 1879.

Extract from "A History of England in the Eighteenth Century," by W. E. H. Lecky, pp. 486–7.

Another and still more important step was the measure which was carried in 1736 for the proper lighting of the streets. Up to this date London was probably in this respect behind every other great city in Europe. The lighting was done by contract, and the contractors, by a singular arrangement, agreed to pay the City £600 a year for their monopoly. In return for this they were empowered to levy a rate of 6s. a year from all housekeepers who paid poor-rate, and from all who had houses of over £10 per annum, unless they hung out a lantern or candle before their doors, in which case they were exempt from paying for the public lamps. The contractors were bound to place a light before every tenth house, but only from Michaelmas to Lady-day, and then only until midnight, and only on what were termed "dark nights." The "light nights" were ten every month, from the sixth after the new moon till the third after the full moon. The system was introduced at the end of the reign of Charles II., and was then a great improvement; but it left the streets of London absolutely unlighted for far more than half the hours of darkness. Under such conditions, the suppression of crime was impossible, and few measures enacted during the eighteenth century contributed more to the safety of the Metropolis than that which was passed in 1736, enabling the Lord Mayor and Aldermen to erect glass lamps in sufficient numbers throughout London, to keep them lighted from the setting to the rising of the sun, and to levy a considerable and general rate for their maintenance. More than 15,000 lamps are said in a few years to have been erected, and it was calculated that, while under the old system London was only lit by public lamps for about 750 hours in the year, under the new system it was lighted for about 5000.

THE MODERN PHASE OF PHYSICAL SCIENCE.

SIR,—I have read with great pleasure "Isca's" very clever article, "The Modern Phase of Physical Science;" but I must confess that it would have pleased me better if it had not been written in quite such philosophic language, as it is not every one who can understand an Aristotle or a Kant.

I regard the article partly as a criticism; and, secondly, as a suggestion that physical science should form the basis of modern education. In this view I perfectly agree; and I further hold the opinion, that since the overthrow of Newton's emission theory by Young's undulatory theory, and the new basis on which physical science has lately been firmly planted by the researches of Grove, Mohr, Mayer, and a host of others, it is time new elementary works on the first principles of physics should be written in plain popular language—such as is adopted by Tyndall—and placed, at a low price, at the disposal of every student, so as to become text-books for elementary schools. I would further suggest, even if considered a presumption on my part, that the works ought to treat of the following matter, in or nearly the succession here given.

Space is infinite. No part of space is a void; therefore every portion of space is filled with matter, substance, from which nothing can be removed and nothing added. The matter, substance, filling space, is, was, and always will be in a state of transformation, which we call motion; and from this law there is no exception.—There are no causes, but only effects.—By the laws of matter in motion one effect has a constant tendency to resolve itself into another effect, which is always an equivalent, the one of the other (nothing can be added or anything removed).—The states in which we are acquainted with matter are: The aëriform, liquid, and solid; and, by induction, a state called "dissociation," in which state of greatly diffused matter the laws of attraction, gravitation, *appear* to be suspended, the presence of this matter in its highly attenuated state being only revealed to us by the obstruction it offers to other effects of matter in motion, as in magnets, the retardation of comets in their orbits, and its own measurable retarded motion or vibrations in conveying to our senses the effects we call light, electricity, heat, a trinity in unity and unity in trinity.—That the action of this trinity of motion in an organic matter gives

rise to another effect of matter in motion, that we call life, as in the development of plants, trees, &c.—That the law of nature is a constant tendency to establish an equilibrium which is never accomplished, or that exists for a second, to be again destroyed (effects of matter in motion).—That from the telescopic observations of nebulæ, the probability and possibility of the entire mass of elements of which a planetary system consists, may be, and were at one time in a state of dissociation, from which, according to the Kant-Laplace theory, by attraction of gravitation and molecular attraction, they enter on their changed conditions, and become suns and planets. (Matter in a state of dissociation appears to give no spectrum of its constituent parts, or only of some of its parts.)—Every substance, whether aëriform, liquid, or solid, is constantly, incessantly giving off portions of its substance to the air, and to the, in the air, permeating ether; in other words, is being slowly dissolved or taking a changed condition to form new nebulæ. The time required for such transformations is to man inconceivable. There is no measurement of space or time possible, the standards adopted by man being merely conventional for purposes of elucidation and comparison.

I would propose that the works should be as concise as possible; and, after treating of general principles, that the subdivisions of physics should be each separately elucidated in the same manner. HOMO.

Legal Intelligence.

HIGH COURT OF JUSTICE—COMMON PLEAS DIVISION.

FRIDAY, Nov. 14.

(*Sittings in Banco, before Justices* GROVE *and* LINDLEY.)

SMITH (APPELLANT) *v.* HICKMAN (RESPONDENT).

This was a case stated by two justices of the Borough of Hastings, under the 20 and 21 Vict., cap. 42, for the purpose of obtaining the opinion of the Court upon a question of law. At the petty sessions held on the 8th of May last, at the Town Hall, Hastings, as reported in the JOURNAL, Vol. XXXIII., p. 763, an informatien was preferred by John Jabez Smith against William Theodore Hickman for an assault alleged to have been committed on April 24. According to the evidence of the complainant, it appeared that he was a collector in the employment of the Hastings and St. Leonards Gas Company. The defendant lived at No. 9, The Mount, St. Leonards, and shortly before eleven o'clock on the morning in question he went to the defendant's house to collect the gas account. He informed the defendant that the account was correct, adding that the meter had been tested and was all right, and that if it had not been so the Company would have been pleased to make an alteration in the account. The defendant said he had been told that before, and he should now put the matter into the hands of his solicitor. Finding that he could not get a settlement, the complainant stepped back and took his hat from the seat on which it had been placed, and put it on, saying he must tell the Manager what the defendant had said. He walked towards the door, but at the defendant continued to complain of the excessive amount of the account, he turned round and took off his hat to answer. The defendant exclaimed, "Stop until I have done speaking." He replied, "I beg your pardon," whereupon the defendant knocked his hat out of his hand, and kicked it as it was falling, followed this up by ordering him out of the house. After he had picked up his hat and walked towards the door, the defendant caught him by the back of the neck and violently pushed him. He asked what he had done to deserve such treatment, and the defendant said, "I am insulted," and slammed the door. In cross-examination the complainant denied that he did anything to insult defendant, or that he talked in a loud and insolent manner. The defendant did not say, "I'll have none of your impudence, leave my house." He did not waive his hat about in front of the defendant's face. His hat was deliberately knocked out of his hand; it was not an accident. The defendant did not simply put his hand on his shoulder and guide him out because he would not go. He had known the defendant a long time, and had always been treated with the greatest civility hitherto. The matter was placed before the Company, and the summons was taken out with the sanction of the Directors. The defendant called witnesses, who gave evidence bearing out the points which he had endeavoured to elicit in the cross-examination of the complainant, and in the result the justices dismissed the information; hence the present appeal.

Mr. BESLEY and Mr. BAGGALLAY appeared for the appellant; Mr. GILL for the respondent.

Without calling upon Mr. Gill, their LORDSHIPS dismissed the appeal with costs, holding that the case did not involve a question of law, but purely one of facts, and the facts were for the decision of the magistrates.

EXCHEQUER DIVISION.—SATURDAY, Nov. 22.

(*Sittings in Banco, before the* LORD CHIEF BARON *and Baron* POLLOCK.)

TATTON *v.* THE STAFFORDSHIRE POTTERIES WATER-WORKS COMPANY.

This case, as reported in the JOURNAL at the time, was tried before the Lord Chief Baron at the last Stafford Assizes, when his lordship directed a verdict for the plaintiff, and the jury awarded £1400 damages. The action was brought by the owner of two dye-works, the Mill Street and Hencroft, to recover compensation, because the defendants reservoir at Tittesworth had, as he alleged, rendered the waters of the River Churnet more foul and muddy, and for a longer period than they usually would be in time of flood, whereby they became unfit for use in dyeing and washing silk. The defendants paid £25 into court, and his lordship stayed execution on condition of £400 being paid to the plaintiff.

Mr. H. MATTHEWS, Q.C. (with whom was Mr. JELF), now moved for a new trial, on the grounds that the verdict was against the weight of evidence, that the damages were excessive, and of the following misdirection:—That his lordship misdirected the jury in saying that the plaintiff must recover, and that the sole question was one of damages, and on the effect of the Statute of Limitations, and on the right of the plaintiff to damages based on the assumption that there was a permanent depreciation and injury, which fact, moreover, was in dispute, and not left to the jury; and as to the nature and extent of the plaintiff's riparian rights in Mill Street, and as to the existence and extent of the plaintiff's water rights at Hencroft; and in not leaving to the jury disputed questions of prescription and riparian ownership; and on the principle which should guide the jury in assessing damages; also in not noticing the alternative defence of payment into court, and in admitting the evidence of a certain witness and the books produced by him. He (Mr. Matthews) contended that most of the damages were barred by the Statute of Limitations, and that the plaintiff had no prescriptive right as to either works. As to Mill Street works, the plaintiff had greatly exceeded his riparian rights, drawing from the Churnet 1½ million gallons of water a year, and returning it foul to the stream; and as to the Hencroft works, he was not a riparian proprietor at all, and could therefore have no such rights.

The COURT granted a rule.

EASTBOURNE COUNTY COURT.—THURSDAY, Nov. 20.

(*Before Mr.* A. MARTINEAU, *Judge.*)

THE LIABILITY OF WATER COMPANIES FOR ACCIDENTS CAUSED THROUGH BROKEN MAINS.

The Eastbourne Water-Works Company were summoned by William Bylett, a fly proprietor, for damage to a horse, and consequent loss of time, the amount claimed being £50.

Mr. BYLES appeared for the plaintiff; and Mr. E. JONES for the defendants.

The *Plaintiff* said that on the 3rd ult., as he was driving down Cornfield Road, the roadway suddenly gave way in the centre, and one of his horse's forelegs went into a deep hole, cutting the knees in such a serious manner as to render the animal useless for nearly a month. He estimated the value of the horse at £50 before the accident, but now it was not worth more than half that sum. It was under the care of a veterinary surgeon for 24 days. Just before the accident he (witness) was earning nearly £1 a day with the fly, and his loss for the 24 days he now made part of the claim.

In answer to the JUDGE, witness said the horse's leg went clean through the crust of the road, and there was no warning of any sort that the road was rotten in the immediate vicinity.

Mr. *George A. Wallis*, the Engineer and Manager of the Company, said he was first made aware that the road had given way by a report lodged at the Company's office, and he at once sent and had the defect remedied. The pressure of water in the main in Cornfield Road was from 50 lbs. to 80 lbs. on the square inch, the latter being the maximum, and an extraordinary pressure.

Mr. BYLES: Will you tell me how many pipes besides this one the Company have had burst from the 29th of September last?

Witness said not one. After the accident he had some pieces of the identical pipe removed and tested. A pressure of 200 lbs. to the square inch was put on by hydraulic power, and no signs of a fracture were visible.

Mr. *Frank Stapley*, Veterinary Surgeon, said the accident had seriously injured the horse's knees, and would leave a blemish which would deteriorate the value of the animal to the extent of not less than £14 or £15. There was no other injury beyond the blemish. The animal was sound, and had recovered, but there still remained the blemish. The horse was under his care for 24 days.

The JUDGE asked how the Company's liability, to say nothing of proof of negligence, was made out.

Mr. BYLES: We simply say the accident is due to the fracture of the water-pipe, which the Company might have prevented.

The JUDGE: I have not had a tittle of evidence yet as to the cause of the bursting of the pipe, and certainly no negligence of any sort has been proved; and as to the liability, the only evidence of that is the fact that the Company sent a man to do the necessary repairs to the pipe.

Mr. *Wallis* (re-called) said, in answer to the JUDGE, that he believed the road gave way in consequence of the subsidence of a sewer trench immediately under the water-pipe. As the ground subsided it was repaired from time to time by the Local Board, and the filling up with the harder material caused the service-pipe to bend downwards, and eventually to break asunder. The water then washed away the soil in the direction of the sewer, leaving the surface of the road intact.

Evidence as to the state of the road, and of the pipe that was fractured, having been given,

The JUDGE said he would consider the case, and if he thought there was any liability on the part of the Company he would let Mr. Jones have a chance to reply in defence at the Lewes County Court. On the present evidence he was prepared to find that there was not too heavy a pressure, and that the pipe broke owing to a subsidence of the soil, and that the horse put its feet on the thin crust of road and went through. Whose duty it was to look after the road—the Water Company, the Sewers Board, or the Local Board—had not been shown. He could not see at present that the negligence of the Company had been proved.

Mr. BYLES said if the judgment was against his client, he should ask that the Local Board be put in as co-defenders, and leave was given to amend the summons accordingly.

PUBLIC LIGHTING AT WYMONDHAM.—On Thursday, the 13th inst., a vestry meeting was held at Wymondham, for the purpose of receiving accounts and appointing inspectors for lighting. This was rather an interesting meeting, the town having for the last three years been lighted with oil, and there being a strong desire on the part of the parishioners that the use of gas should be resumed. Mr. J. R. Barnard made some remarks as to the difference of circumstances between the present time and three years ago, when the Gas Company asked such a price as was considered exorbitant, besides which they were supplying another public body with gas at a cheaper rate. The Company having made a great addition to their works, and having now offered to supply the town at the same rate as the other public body, and there being no comparison between the lighting qualities of oil and gas for the purpose of public lighting, he considered it was desirable that the town should be lighted with gas. Several of those present having supported this view of the question, the Rev. W. H. Daniels proposed, and Mr. E. L. Semmence seconded—"That the town be henceforth lighted by gas by the Wymondham Gas Company, at 5s. per 1000 cubic feet, subject to such regulations as are necessary to the equitable carrying out of the contract." The accounts for the past year having been read, were approved and passed; and the sum of £120 was voted for lighting the town for the ensuing year.

BENZOLINE *v.* GAS FOR STREET LIGHTING.—Being unable to come to terms with the Proprietor of the local gas-works, as to the lighting of the streets under their control, the Sidmouth Local Board recently decided to resort to the use of oil lamps; but the result is not at all satisfactory, judging from the correspondent of a local paper, who thus complains:—"How in the name of fate the Sidmouth Local Board could admit, at their last meeting, that they are satisfied at the result of the present mode of lighting, is beyond conception. For some reason, best known to themselves, but ostensibly to save expense, they determined to try the experiment of substituting 20 benzoline lamps for the 86 gas ones of past years, and, as a matter of course, the result has proved worse than a miserable failure. For instance, from some cause or other, one hears of a lamp four nights out of six burning one hour instead of eight, of another flickering till one's eyesight is blinded, of the flame of another being of every imaginable size and shape, of 10 out of the 20 being often unlit until between six and seven p.m., and of the narrowest thoroughfares having no light at all. Lodging-house keepers and private families here and there are being sorely taxed, through being compelled to rent the gas-lamps in self-defence, and visitors and ratepayers are grumbling and growling at the self-satisfied legislation of the officials, and one and all are alike of opinion that in two respects the experiment has proved admirably successful—first, in placing the town completely at the future mercy of Mr. Dunning; and, secondly, in making darkness visible."

Miscellaneous News.

METROPOLIS GAS SUPPLY.

COURT OF COMMON COUNCIL.

At the Meeting of the Court last Thursday—the Lord Mayor (Sir F. W. Truscott) presiding—the Gas and Water Committee presented the following report in respect to the proposed application to Parliament, during next session, for an amendment of the penalty clauses of the Chartered Gas Company's Act of 1876:—

Our attention has been called to the subject of the penalties to which, under the existing laws, certain of the Metropolitan Gas Companies are liable in the event of their failing to supply gas of the prescribed illuminating power, purity, and pressure, and we have received a communication from the Board of Trade, dated Jan. 10, 1879, enclosing a letter from the Gas Referees as to certain difficulties which exist in the present state of the law in regard to the positions of the gas testing-places in the Metropolis, and asking the Corporation to favour the Board with their observations thereon.

A copy of the letter of the Gas Referees was also forwarded, and in this was a detailed account of the difficulties which have arisen in consequence of the mixture of the gas manufactured at different places, and of ascertaining from whence the gas was supplied, and the desirability of placing the testing-places in or near the localities where the gas is consumed. Under existing circumstances, and under the Acts of 1868 and 1876, the provisions of these Acts cannot be complied with, nor can any penalty for defect of illuminating power, except of 40s. for the first half candle, be recovered as the Acts now stand. The Gas Referees further state that the alternative principle of fixing the testing-places at or near the manufacturing stations would meet the difficulties, but that the public might not be fully satisfied with such a position of testing-places, as being in many cases far removed from the districts in which the gas is supplied, and as offering less security for the independence of testing. The Gas Referees also called attention to the difficulty in regard to the testings for pressure, and, on the grounds above stated, they ask the Board of Trade to consider the subject of the testing-places generally, with a view to the amendment of the law in regard to them. The Gas Referees conclude by stating that the points to be considered may be limited to two—namely, (*a*) Whether some more satisfactory provision could not be made for the testings for pressure; (*b*) Whether, as a general principle, it would be better to fix the testing-places for quality at or near the manufacturing stations, or within the districts where the gas is consumed.

In accordance with the request of the Board of Trade, we directed a reply to be sent to them, giving the views of your Committee with respect to the two points mentioned by the Gas Referees.

First, as regards the question of pressure. After careful consideration of the matter, we suggested that a constant record of pressure should be kept by means of self-registering pressure-gauges at each of the testing-places appointed by the Gas Referees, and, in addition, that observations of the pressure should be made at indefinite periods at certain of the street-lamps in various parts of the districts, in a manner to be determined by the Gas Referees, such testings to be not less than twice a week, and also that upon complaint from any consumer or other person to the Gas Examiner as to a deficiency of pressure in any specified locality, he should take a test of the pressure at the nearest available street-lamp within 24 hours of such complaint being lodged in writing at his office.

Secondly, as regards the position of the testing-places for illuminating power and purity, and having in view the difficulty of ascertaining from what manufacturing station the gas is supplied to a particular district, it is most desirable that tests should be made so as to obtain results from the gas as supplied to the consumers; and as experience has proved that testing near the manufacturing stations is unsatisfactory, it appears to the Committee to be desirable as a general principle that the testing-places for quality should be fixed within the districts where the gas is consumed; and they are also of opinion that the advantages which would be obtained would more than counterbalance any possible objections which might be raised to the system.

In order to carry out this principle, it would be necessary to make an alteration in the law as regards penalties for deficiency of illuminating power and purity, and clause 50 of The Gaslight and Coke Company's Act of 1876 would require to be amended, so as to extend the principle in the aforesaid clause, by which a penalty for the first deficiency of half a candle of illuminating power is fixed at 40s., and fixing a penalty for each succeeding half candle deficiency, excluding all consideration as to where such gas is manufactured, or its quantity. This alteration would also necessitate the amending of certain other clauses by the omission of words which refer to particular manufacturing stations. If these suggestions were carried out, the Committee believe that the Gas Referees would have no difficulty in so fixing the locality of the several testing-places as to ensure as far as possible an actual testing of the quality of the gas delivered to each part of every district.

We have since received a communication from the Gas Referees that, in accordance with the desire expressed to them on more than one occasion by your Committee, they propose to prescribe three testing-places for gas manufactured by The Gaslight and Coke Company within the City. Also that they propose at the same time to do away with the testing-places now prescribed at Beckton and Bow Common. That they propose that these three new testing-places shall correspond with the three valve-houses, through which all the gas supplied to the City passes, so that the gas distributed from each may be tested separately—namely, in (1) Aldgate High Street, (2) Aldersgate Street, (3) Bridge Street, Blackfriars.

We also received a further communication from the Board of Trade, stating: "It will not be possible to effect the necessary alteration in the law during the present session, as The Gaslight and Coke Company's Bill, in which clauses might have been inserted, has been withdrawn, and a special Bill dealing with the subject could not be brought in without the suspension of the Standing Orders. In these circumstances the Board of Trade would suggest that the Corporation and the Metropolitan Board might confer as to the expediency of giving the necessary notices in the coming autumn of a Bill to be introduced into Parliament next session, and I am to add that, should the Corporation and the Metropolitan Board decide to adopt this course, the Board of Trade will be prepared to give all reasonable aid in furthering the object in view."

We likewise received a communication from the Metropolitan Board of Works, expressing a desire to confer with your Committee upon the subject of an alteration in the existing law as to testing-places, and the recovery of penalties incurred by Gas Companies.

Under these circumstances, we beg to recommend that your Committee should be authorized to confer with the Metropolitan Board of Works as to giving the necessary notices, either separately or in conjunction with the Board, as may appear advisable, for the introduction of a Bill in the next session of Parliament, in accordance with the suggestion of the Board of Trade; and further, that we should be also empowered to give such notices accordingly. We also recommend that we should be authorized to confer with the Gas Referees, and, if deemed desirable, with The Gaslight and Coke Company, with respect to such Bill.

Deputy KELDAY said the Committee had already given notice of a Bill, and he hoped the Court would sanction what had been done.

It was, however, agreed to defer the consideration of the question.

METROPOLITAN BOARD OF WORKS.

At the Meeting of the Board last Friday—Sir J. M. HOGG, M.P., in the chair—the Special Purposes and Sanitary Committee submitted the following report:—

Your Committee have to report, with reference to the letter from the Board of Trade, relative to the question of the difficulties which attend the working of the law respecting the places for testing gas, and the recovery of penalties incurred by certain of the Companies in cases where the gas is defective in quality or pressure, referred back by the Board on the 11th of July, with authority for the Committee to confer with the City Corporation on the subject, that a letter has been received from the Town Clerk, transmitting a copy resolution of the Gas and Water Committee of the Corporation, to the effect that the Committee are of opinion that, under existing circumstances, the most desirable course, with respect to the proposed amendment of the law on the subject, is, that the parliamentary notices on behalf of the Corporation should be given separately, the Committee reserving for future consideration the advisability, under sanction of the Court of Common Council, of joint action with the Board in the matter.

This letter your Committee submit for the information of the Board.

On the motion of Mr. RICHARDSON, the report was received and adopted.

ADOPTION OF THE AVERAGE METER SYSTEM IN ST. OLAVE'S, SOUTHWARK.—At the meeting of the St. Olave's District Board of Works last Tuesday, the General Purposes Committee recommended that the average meter system be adopted for the supply of gas to the public lamps, in accordance with the letter from the South Metropolitan Gas Company.

METROPOLIS WATER SUPPLY.

COURT OF COMMON COUNCIL.

At the Meeting of the Court last Thursday—the LORD MAYOR in the chair,

The REMEMBRANCER reported that notice had been given of a Bill to create a Water Trust, with power to purchase the Water Companies of the Metropolis; and he suggested that the question should be referred to the Commissioners of Sewers and the Gas and Water Committee.

This was agreed to.

The report of the Gas and Water Committee, upon the several references relative to the supply of water to the Metropolis, recommended that they be discharged, and further that the Committee should be authorized to watch any proceedings that might be taken by the Government with respect to the Water Supply of the Metropolis.

Deputy KELDAY, in moving the adoption of the report, stated that the Committee having been authorized to communicate with the Government in regard to the measure which the Home Secretary had promised on the question of the London Water Supply, communication had taken place, and the Committee had been advised by Mr. Cross that any interference on the part of the Corporation would only tend to complicate matters. Under these circumstances the Committee proposed to content themselves with the authority to watch any proceedings that the Government might take on the subject. They were assured that in any arrangements that might be made the interests of the Corporation would not be overlooked.

This was also agreed to.

Lieut.-Col. Bolton, in his report to the Local Government Board, on the water supplied by the Metropolitan Water Companies, during last month, says: "The state of the water in the Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was indifferent from the 1st to the 7th of October, when it improved, and afterwards continued good during the month. The highest flood state of the river at West Molesey during the month was 3 ft. 1 in., and the lowest 1 ft. 1 in. above the summer level, the rainfall at this place being 0·73 inch. The water in the River Lea was generally good during the month. [These remarks refer to the condition of the water previous to filtration.] The water at the intakes was generally in a much better condition during the month of October than it was in the previous month, and the filtration was efficient. The water supplied by the whole of the Metropolitan Water Companies was clear, bright, and properly filtered."

THE AMALGAMATION OF THE SOUTH METROPOLITAN AND PHŒNIX GAS COMPANIES.

THE SCHEME SUBMITTED TO THE BOARD OF TRADE.

The first thirteen clauses of the scheme submitted to the Board of Trade for the amalgamation of the South Metropolitan Gas Company with the Phœnix Gaslight and Coke Company, under the powers and provisions of the South Metropolitan Gaslight and Coke Company's Act, 1876, and the Acts incorporated therewith, are (excepting the change of name and date, and one or two minor alterations noted below) the same as those proposed and accepted in the case of the recently completed amalgamation of the South Metropolitan and Surrey Consumers Gas Companies. These clauses were set out in full as recently as the JOURNAL for May 13 this year (Vol. XXXIII. pp. 722-3), so need not be repeated in detail, the variations only being mentioned.

1. Commencement of operation of scheme.—Jan. 1, 1880.
2. Amalgamated Company to be called South Metropolitan Gas Company.
3. Works and properties of the two Companies vested in the United Company.
4. All rates payable to the United Company.
5. Debts, &c., of the two Companies to be debts of the United Company.
6. Contracts, agreements, &c., preserved by the United Company.
7. Actions or parliamentary proceedings not to abate.—Proceedings in Parliament mentioned, so as to cover the notices issued by both Companies for Bills to be promoted next session.
8. Books to be evidence.
9. Accounts of the two Companies to be made out separately up to Dec. 31, 1879.
10. Application of the reserve-fund.
11. Registers of amalgamating Companies to subsist until replaced.
12. Resolutions, &c., continued.
13. General saving of rights and claims.

Constitution and Regulation of United Company.

14. Provisions of existing Acts continued.—The Acts relating to, or affecting the South Metropolitan Company and the Phœnix Company in force at the date of the commencement of this scheme, shall, except so far as the same are varied by, or inconsistent with this scheme, remain in full force; and all rights and powers of such Acts, or any of them, conferred on and vested in either of the two Companies in relation to the undertaking of such Company, may be enjoyed and exercised by the United Company: Provided that in the event of the provisions of any Act of the Phœnix Company being inconsistent with those of any Act of the South Metropolitan Company, the provisions of the Acts of the last-named Company shall (except otherwise specially provided by this scheme) prevail and be observed by the United Company.

15. Half-yearly Meetings.—The half-yearly general meetings of the United Company shall be held so soon after the 31st of December and the 30th of June in each year as the Directors may deem expedient, but not later than the months of April and October respectively.

16. Directors of the United Company.—On the confirmation of this scheme, the Directors of the Phœnix Company shall select from their own number five members to unite with the seven Directors of the South Metropolitan Company, and become Directors of the United Company; and thereupon the Directors of the United Company shall be twelve. Provided that on the retirement of the present Secretary and Engineer of the South Metropolitan Company he may be appointed a Director, and thereupon the number of Directors may be increased to thirteen until the next vacancy occurs, when they shall again be reduced to twelve.

17. Remuneration to the Directors.—The fees payable to the Directors continuing in office shall, subject to the provisions of the South Metropolitan Company's Special Act, 1842, and so long as there are only twelve, not exceed £5000 per annum; but if that number be increased to thirteen, the fees may be increased in like proportion.

18. Retiring allowances to be carried to a suspense account.—The rate of compensation payable to any Director required to vacate his office under the foregoing provision shall be equal to seven years purchase of the fees receivable by him in the year previous to the amalgamation, and the amount of such retiring allowance shall be charged upon the general funds of the United Company, and shall be carried to a suspense account, which shall be liquidated by equal annual instalments during the next seven years.

19. As to retirement of Secretary and Engineer of the South Metro-

politan Company.—On the retirement of the present Secretary and Engineer of the South Metropolitan Company from those offices, and his appointment as a Director as hereinbefore provided, any other Director who may have been in office at the commencement of this scheme may retire and receive compensation at the rate he would have been entitled to receive if he had retired at that date.

20. Rotation of Directors.—At the first ordinary meeting to be held in every year after the confirmation of this scheme, two Directors shall retire from office, and the Shareholders present in person or by proxy shall elect persons to supply the places of the Directors then retiring from office, agreeably to the provisions in the Companies Clauses Consolidation Act, 1845, and the persons elected at any such meeting, being neither removed nor disqualified, nor having resigned, shall continue to be Directors until others are elected in their stead in manner provided by the same Act.

21. Auditors; remuneration and retiring allowances.—The Auditors of the two amalgamating Companies in office at the date of the commencement of this scheme shall continue in office until the first general meeting, at which the Auditors are appointed, held by the United Company. At that meeting the Shareholders of the United Company shall elect three Auditors, and thenceforth the number shall be three, and the remuneration shall not be more than £75 per annum each, and any person being an Auditor of either of the two Companies at the time of the amalgamation, who is not elected an Auditor of the United Company at the said general meeting, shall be entitled to a gratuity equal to two years salary.

22. Officers, &c., of the two Companies to be Officers, &c., of the United Company.—As in the scheme previously mentioned, Vol. XXXIII., p. 723.

23. Salaried officers to receive annuity for life.—Ditto.

24. Salaried officers not entitled to annuities may be compensated.—Ditto.

25. Annuity may be increased by sanction of the Board of Trade.—Ditto.

26. Gratuity to weekly servants.—Ditto.

27. Decision as to offices abolished.—Ditto, with this proviso: "That the present Secretary and Engineer of the South Metropolitan Company may, at any time within four years from the confirmation of this scheme, retire from those offices, and receive, under the provision of clause 23, an annuity or retiring allowance of the same amount as he would have received if he had retired at the commencement of this scheme; and such annuity, if compounded for, shall be computed at the same amount as it would have been at that date."

28. Capital.—The authorized capitals of the two Companies at the commencement of this scheme shall be the authorized capital of the United Company, and shall be classified and arranged under different heads in manner following, viz.:—

Acts relating to the Two Companies.	S. M.	P.	Amount Authorized by each Act.	Total of each Class under this Scheme.	Called up.	To be Called up.
A Capital.						
5 & 6 Vict., c. 79 .	1842	..	£250,000			
32 & 33 Vict., c. 130 .	1869	..	250,000			
				£500,000	£500,000	—
B Capital.						
17 & 18 Vict., c. 94 .	1854	..	£150,000			
26 Vict., c. 37 .	1863	..	100,000			
39 & 40 Vict., c. 239 . (part of £250,000.)	Unissued 1876	..	10,000			
5 George. IV., c. 78 .	..	1824	540,000			
7 & 8 Vict., c. 159 .	..	1864	200,000			
				1,000,000	990,000	£10,000
C Capital.						
39 & 40 Vict., c. 239 . (part of £250,000.)	1876	..	£240,000	240,000	—	240,000
D Capital. Limited to 7½ per cent.						
7 & 8 Vict., c. 159 .	..	1864	360,000	360,000	324,000	36,000
E Capital. Limited to 5 per cent.						
7 & 8 Vict., c. 159 .	..	1864	144,000	144,000	144,000	—
Totals			..	£2,244,000	£1,958,000	£286,000

The United Company shall call up and raise the unissued capital of £286,000 in the following order, that is to say:—First, the £10,000 of B capital; second, the £36,000 of D capital; third, the £240,000 of C capital.

29. Dividend on different classes of shares.—The three classes of capital, A, B, and C, shall participate equally in the profits up to 11 per cent., but in the event at any time of a larger dividend than 11 per cent. being payable on the said three classes, one-half of such larger dividend that, but for this agreement and scheme, would be payable to the holders of B capital, shall be paid to the holders of A capital in addition to their own proportion of such larger dividend as aforesaid. The dividend of 7½ per cent. on D capital shall not be reduced below 7½ per cent. until the dividend on A, B, and C capitals is reduced below 7½ per cent., then A, B, C, and D capitals shall all share equally. And, in like manner, the dividend of 5 per cent. on E capital shall be maintained until the other capitals are reduced below that amount of dividend, when A, B, C, D, and E capitals shall all receive an equal dividend.

30. United Company to issue new certificates.—The United Company shall, as soon as may be after the confirmation of this scheme, convert all the shares into stock, and call in all certificates in the Phœnix Company, and issue in lieu thereof, and at their own expense, new certificates specifying the class to which they belong in the name of the United Company.

31. Borrowing powers.—The amount authorized to be borrowed by the United Company shall be the aggregate of the amounts authorized to be borrowed by the special Acts of the two Companies respectively, and which, at the date of this amalgamation, are as follows, viz.:—

—	Authorized.	Issued.	To be Issued.
South Metropolitan Company—			
32 & 33 Vict., c. 130, 1869.	£62,500	£62,500	—
39 & 40 Vict., c. 229, 1876.	187,500	—	£187,500
17 & 18 Vict., c. 94, 1854.	35,000	35,000	—
26 Vict., c. 37, 1863.	25,000	25,000	—
Totals	£310,000	£122,500	£187,500

32. United Company may exercise powers of raising capital.—The United Company may exercise in its own name the powers possessed by the two Companies at the date of the amalgamation, of raising capital by shares or by borrowing, in the same manner and to the same extent as either of the said two Companies might have done before the amalgamation; but, in exercising the further borrowing powers of £187,500, the United Company shall give the Proprietors of A capital the option of taking it up before offering it to the Proprietors of any of the other classes.

33. District of the United Company.—The district to be supplied by the United Company shall be the districts now supplied by the two Companies respectively, and the provisions of the South Metropolitan Company's Act, 1876, respecting the illuminating power and purity of the gas to be supplied, and the price to be charged for the same, and as to the appointment of Referees and Examiners to test the illuminating power and purity, and also the provisions for the regulation of the dividend to be paid to the Shareholders by the price charged to the consumer, and the appointment of a Public Auditor by the Board of Trade to examine the accounts and other matters, shall apply to the United Company and the whole of the district supplied by them, and the bye-laws, restrictions, orders, and proceedings of the South Metropolitan Company shall continue in force with and be applicable to the United Company.

Provided that the penalties imposed by sections 51 and 52 of the South Metropolitan Company's Act, 1876, respecting deficiencies in the illuminating power or purity of the gas supplied in the district of that Company, shall not apply to the gas supplied in the district of the Phœnix Company until eighteen months after the commencement of the amalgamation.

Provided also that if the price of 3s. 4d. now charged in the district supplied by the Phœnix Company is maintained at that or any lower rate, and the price of 3s. now charged in the district supplied by the South Metropolitan Gas Company is continued at that or any lower rate, the United Company may, for a period of twelve months after the commencement of the amalgamation, pay dividends on the capital of each Company respectively, according to the price charged in the district of each Company, as prescribed by section 21 of the South Metropolitan Company's Act, 1876, and subject nevertheless to clause 30 of the scheme of amalgamation between the South Metropolitan and the Surrey Consumers Companies.

34. United Company may sell and dispose of lands.—As in the scheme previously mentioned, Vol. XXXIII., p. 724, clause 37.

35. Interpretation of scheme.—Ditto, clause 38.

36. United Company to pay costs of amalgamation.—Ditto, clause 39.

URBAN WATER SUPPLY.

On the 23rd of May, 1878, the Marquis of Stafford moved in the House of Commons for certain information on the above question; and, it having been obtained, towards the close of last session he moved that the return be printed. On Wednesday it was issued in the form of a Blue-Book, containing 150 pages of closely-printed tabulated matter, showing the means by which drinkable water is supplied to every Urban Sanitary District in England and Wales, such means being provided by public or private arrangements. The return states for each district—

1. The name and population according to the census of 1871.
2. The source from which water is supplied.
3. The arrangements made for the supply (*a*) by reservoir, (*b*) wells, artesian or otherwise, (*c*) rivers, if filtered or not, (*d*) any other arrangements.
4. Amount of daily supply, and whether or not the supply is sufficient.
5. Whether the supply is constant or not, and the quantity used daily.
6. The rateable value of the district.
7. The capital cost of the permanent works, if any.
8. The annual payment for principal and interest on money borrowed for the works.
9. The average annual cost of maintaining the works.
10. The annual amount of the water-rates and rents, if any.
11. The Act of Parliament or other authority under which the works have been executed.
12. What improvements, if any, are considered necessary.

Answers were obtained from 944 Urban Sanitary Districts, the particulars generally relating to the latter half of 1878. In several instances, at the time of making the return, the Authorities were entering, or about to enter, upon undertakings for the improvement of the water supply. The acreage of the districts in many cases is not stated, the Authorities, apparently, not knowing the area which the limits of their jurisdictions embrace.

LAMBETH WATER-WORKS COMPANY.

The following are the report and revenue account of this Company, to be presented at the Ordinary Half-Yearly General Meeting of Proprietors held to-day at the Offices, Brixton Hill:—

The Auditor appointed by the Local Government Board, under the Metropolis Water Act, 1871, and the Company's Auditors, have certified the correctness of the accompanying accounts for the half year ended Sept. 30, 1879.

During the half year 1593 houses and other supplies, which are estimated eventually to yield an annual water-rental of £4117, have been connected with the Company's works.

The capital account shows an expenditure in the six months of £18,606 6s. 9d.

The bond and debenture debt has been reduced by payments, on the first of November, to £89,055.

A call of £15 per cent. on the whole, half, and quarter shares, numbered from 11,094 to 12,986, was payable on the 1st of July, and has been duly met. A final call of £15 on these shares has been made payable on the 1st of December next. The Directors will, in accordance with the resolution of the general meeting of the 27th of May last, create and issue, when the transfer books are closed in December, about £118,000 share capital, which will be entitled to a maximum dividend of 10 per cent. The allotment will be made and offered to the Proprietors proportionately according to their holdings of shares. The deposit will be payable on Jan. 1, 1880.

The surplus transferred from the revenue account to the dividend and interest account is £44,549 6s. 5d. After payment of interest on the bond and debenture debt, and the debenture stock, there remains an available sum of £40,334 7s. 7d., out of which the Directors recommend to the Proprietors the distribution of a dividend for the half year ended Sept. 30, 1879, at the rate of 6½ per cent. per annum, which will, it is estimated, amount to £36,427, leaving a balance of £3907 to be carried forward.

The Engineer reports:—"With regard to the new filtration works at Ditton, the subsiding reservoir next the Portsmouth Road, and the adjoining filter-bed, are formed, the brickwork of the sides fairly advanced, and both will be completed in two months. The other three filter-beds are formed and nearly puddled round, and the excavation of their interior is progressing. The supply and draw-off pipes, and also the drains and tanks for the entire work, are nearly finished. The excavation for the foundation of the new engine and boiler house is about completed, all the boilers are delivered on the ground, and the work in connection with the engines will now proceed rapidly. The new boundary wall on the north side of the Portsmouth Road is nearly finished. If, as is expected, the Contractor uses due diligence, these works should be completed and brought into use within the contract time, which expires in August next. The boring at Ditton reached the chalk at 385 feet from the surface, and water rises to the surface and flows over with considerable force, and that, in his opinion, by making an artesian

well a large quantity of fine water could be obtained as an auxiliary supply. With the view of ascertaining the depth of the chalk at the Molesey works, a boring similar to that at Ditton is now being made there, and is approaching completion. With the view of affording a better supply to the increasing districts of Tooting, Garrett, and Wimbledon, a 12-inch main is being laid from Norwood reservoir to Wimbledon Park. The whole of the Company's works are in efficient working order."

The extension of the constant supply in the Company's district is being comprehensively carried out. The second division of the town district, comprising 7404 houses in Camberwell, Newington, and Walworth, is under notice to be ready to receive constant supply on the 1st of January next. Besides this division, at present 5800 houses in the Company's district have constant supply afforded them. The Directors are desirous of extending this service as rapidly as possible, but great obstacles are constantly met with, through owners and occupiers of houses not putting their fittings in order to receive it. In No. 1 division of constant supply the Company's workmen are fixing 24 fire hydrants, by direction of, and for the Metropolitan Board of Works. It is to be regretted that that Board does not see its way to direct more hydrants to be fixed to the many miles of constantly charged mains throughout the Company's district.

Mr. Cross, Secretary of State for the Home Department, has announced from his place in Parliament his intention to investigate, before the House of Commons re-assembles, the question of the Metropolitan Water Companies "surrendering their powers to somebody practically appointed by the Government. Whenever the matter is considered, the Lambeth Company has a perfectly clear, good, and straightforward case to submit to the Government or Parliament. Its chief supply is derived from a source approved by the Legislature. Large subsiding reservoirs and the provision of supplementary sources of supply from underground enable the Company at all times to avoid taking water from the river during flood, and thereby to maintain the quality of the water distributed. The increased area of the filter-beds, the pumping power of the engines, the capacity of the storeage reservoirs for filtered water, and the main distributing works, are sufficient not only to meet the ordinary growth of the Company's district for some time to come, but also to admit of constant supply being given in accordance with the requirements of the Legislature. In that and every other respect the Company has endeavoured to fulfil its public duties. It has laid mains and extended supplies (some of which have for years been unremunerative) wherever it has been called upon to do so throughout its wide and for some time sparsely populated district. And it has sought to levy the rates, under its parliamentary powers, in all cases in a reasonable and equitable manner. The Directors contemplated that the time had now arrived when the Proprietors would be able to reap more rapidly the reward of their liberal and judicious outlay. Whatever action the Government may take, and under all circumstances, the Directors will do their best to maintain the interests of their co-Proprietors.

Dr.—Revenue Account, for the Half Year ending Sept. 30, 1879.

Maintenance.						
To Maintenance and repair of impounding and service reservoirs, filtering beds, works, and pipes, or for obtaining and storing of water, including the cost of materials and labour		£795	1	0		
Maintenance and repair of mains, pipes, fittings, meters, and works connected with distribution of water, including the cost of materials, labour, and renewals		4,667	15	3		
Pumping and engine charges, including the cost of coals, wages, &c.		9,569	8	2		
Filtration, including the cost of materials and labour		601	12	0		
Salaries of Engineer (or Superintendent) and Clerks, and wages of Inspectors and Turncocks		2,934	8	6		
Rents of houses and lands, accrued due to date, and owing by the Company		106	2	6		
Thames Conservancy		1,126	0	0		
Rates and taxes		3,786	17	9		
					£23,587	5 2
Management.						
Allowance to Directors		£918	15	0		
Allowance to Company's Auditors		32	3	1		
Salaries of Secretary, Accountant, and Office Clerks		902	18	4		
Superannuations of servants of the Company		447	17	1		
Commission to Collectors		1,706	12	9		
Stationery, printing, and general establishment charges		317	0	5		
Law and parliamentary (opposition) expenses		1,712	13	0		
Official Auditor and Water Examiner		69	11	0		
					6,107	10 6
Dividend and interest account for transfer of profits					44,549	6 5
Balance carried to next account, to provide for losses					5,000	0 0
					£79,244	2 1

Cr.—Revenue Account.

By Balance brought from former account	£5,000	0	0			
Surcharges on rental to March 31, 1879	448	2	11			
		£5,448	2	11		
Less sums written off as losses—viz.: Empty houses, houses cut off, and bad debts	4,111	2	6			
					£1,337	0 5
Water-rents accrued to the date of this account					77,877	8 2
Rents of houses and lands accrued due to date, and owing to the Company					19	17 0
Fees received for registration of shares, transfers, &c.					9	16 6
					£79,244	2 1

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held at the London Offices, 30, Gracechurch Street, on Tuesday last—Thomas Hughes, Esq., Q.C., in the chair.

The Secretary (Mr. Alfred Lass) having read the notice convening the meeting, the following reports and accounts were presented:—

The Directors have much pleasure in submitting to the Shareholders the accounts of the Company for the half year ending the 30th day of June, 1879. These, with the annexed report of the Engineer, show the progress of the Company.

The Directors have to state that the profit for the half year has amounted to £1361 2s. 1½d., which, added to the balance brought from the last account, makes £2915 10s. 10½d., and that after paying the dividends to Dec. 31. 1878, and the interest on debentures to June 30, 1879, there remains an available balance of £1499 0s. 8½d., out of which the Directors recommend the declaration of a dividend for the half year ending the 30th day of June last, on the preference share capital at the rate of 8 per cent. per annum, and on the ordinary share capital at the rate of 7 per cent. per annum, both less income-tax (except upon those dividends payable to the local Shareholders), leaving a sum of £331 12s. 8½d. to be carried forward to the next half year's account.

The dividend, if sanctioned, will be payable on the 1st day of December next.

Engineer's Report.

Gas-Works, Georgetown, Aug. 23, 1879.

To Thomas Hughes, Esq., Q.C., Chairman, and the Directors of the Georgetown (British Guiana) Gas Company, Limited.

Gentlemen,—I have much pleasure in submitting to you my usual half-yearly report. During the past half year the old coal store has been removed to the end of the river boundary wall, which has placed it in a line with the new coal store recently erected. The extension of the purifier-house gives room for two additional purifiers, as well as additional room for the revivification of the oxide. The fittings stores, together with the fitters shop, photometer-room, and a lean-to roof shed, have been completed. In the gas-fitting department there has been great depression. During the past six months ten houses have been fitted with 144 lights, and 76 additional lights have been fitted, making a total of 220. The mains have been extended 26 yards in Princes Street, and 38 yards in Robb Street, in addition to which nine new services have been laid. The illuminating power of the gas has been good, and the supply has been satisfactory. Although the price of gas has, from the 1st of January last, been reduced, yet the amount realized during the six months ending the 30th of June last exceeds the foregoing six months by 172·88 dols. The whole of the works and machinery are in good order and thorough repair.

Thanking the Directors for their kind attention, and hoping that the results of the last half year's working will be satisfactory, I have, &c.,

(Signed) Thos. B. Younger, Engineer and Manager.

Dr. *Balance-Sheet, June* 30, 1879. Cr.

Share capital—				Fixed plant, mains, and services, as per last account	£35,595	3	1	
6200 fully paid £5 shares	£31,000	0	0	Add since expended	356	7	2½	
412 £5 preference shares, fully paid	2,060	0	0		£35,951	10	3½	
Debenture bonds	6,800	0	0	Stock in hand	3,589	14	8½	
Retort renewal-fund account	78	13	3	Cash at bank and in hand	824	3	11	
Bad debt fund	308	19	1½	Bills receivable	300	0	0	
Bills payable	138	10	7	Amounts owing by sundry persons	2,291	14	7	
Reserve-fund account	500	0	0					
Insurance-fund	15	5	10					
Amounts owing to sundry persons	756	14	0					
Profit and loss account, net revenue	1,499	0	8½					
	£43,157	3	6½		£43,157	3	6½	

Revenue Account.

Coals and bitumen	£898	3	1	Gas and rental of meters	£3,528	2	7	
Purifying account	31	2	11	Residual products and fittings, &c.	443	16	5½	
Wages account	461	11	1					
Repair and maintenance of works and plant, &c.	211	19	4					
Salaries	620	8	4					
Rent, rates, and taxes	59	18	1					
Directors and Auditors fees	158	8	0					
Trade and general charges	103	18	7½					
Bad debts and allowances	53	12	10½					
Law charges	11	14	6½					
	£2,610	16	10½					
Balance carried to profit and loss, net revenue	1,361	2	1½					
	£3,971	19	0½		£3,971	19	0½	

Profit and Loss (Net Revenue) Account.

May 6, 1879—				Jan. 1, 1879—				
Dividend, &c., paid to Shareholders to Dec. 31, 1878	£1,185	14	6	Balance brought from last account	£1,554	8	9	
June 30, 1879—				June 30, 1879—				
Interest on loans, debentures, &c., to June 30, 1879	230	15	8	Revenue account—balance brought down	1,361	2	1½	
Balance carried forward to the next half year's account	1,499	0	8½					
	£2,915	10	10½		£2,915	10	10½	

The Chairman said he had to move—"That the report and accounts be received and adopted." Fortunately for all of them, the Company pursued its uneventful, but not unsuccessful course, and the Directors were happy again to report steady, though not very great progress made in the past half year. The works, as the Shareholders would see by the report of the Engineer and Manager, were in excellent order, and during the past half year there was expended on extensions—in fact, on permanent improvements and on new plant—a sum of £356. Then, during the same period, there had been a reduction in price to consumers of over 50,000 cubic feet of gas per month. This reduction was made by the Board after careful consideration and with some hesitation. The price was practically a reduction of 5d. per 1000 feet, or, in American money, from 3·60 dols. to 3·50 dols., which, of course, was a considerable decrease; but the Board were happy to say that the policy adopted had been successful, and that the gas-rental, in spite of this reduction, had increased during the half year. They were also glad to report that under their present Engineer and Manager the working expenses had been reduced as compared with the corresponding period of 1878. As the result, therefore, the balance carried forward was £1499, out of which the Directors proposed to pay a dividend at the rate of 7 per cent. on the ordinary shares; of course, with the covenanted rate on the preference shares. That left a sum of £331 12s. 8½d. to be carried forward to the next half year's account. There was another good feature, which he thought the Shareholders would be pleased to notice. This was, that the reserve-fund, which at this time last year was £250 only, had been doubled, and now stood at the sum of £500; and this was not the only reserve-fund of the Company, because there was in addition a sum of £308 19s., which had been put by to meet any chance of loss from bad debts or other contingencies. He thought, under these circumstances, that the Shareholders would agree with the Board that the state of things was satisfactory in the present, and gave every indication and promise of even a better future.

Mr. Alfred Williams seconded the motion, which was put, and carried unanimously.

The Chairman said the only remaining business was for him to move—"That dividends for the half year ending the 30th of June last be declared on the preference shares at the rate of 8 per cent. per annum, and on the ordinary shares at the rate of 7 per cent. per annum, both less income-tax, except on those dividends which are payable to the local Shareholders, the same to be paid on the 1st day of December next."

Mr. Williams seconded the motion, which was carried unanimously.

Mr. W. H. Crockford asked what was the price of gas to the lowest consumer.

The Secretary said it was 3·50 dols. per 1000 feet to all consumers who took 50,000 cubic feet and under per month, and 3 dols. per 1000 feet to consumers who took above that quantity.

The Deputy-Chairman (Mr. H. P. Stephenson): The lowest price is 12s. 6d., and the highest 14s. 7d. per 1000 feet.

Mr. E. K. Blyth said he should be sorry for it to go forth to the world that the Shareholders in this Company were an ungrateful body to the Directors, who appeared to have attended to their business so well, and he therefore moved that the thanks of the meeting be given to them. He always liked to see a reserve-fund growing, and as it had now begun he hoped it would eventually reach a substantial sum.

Mr. R. King seconded the motion, which was carried unanimously.

The Chairman, in reply, expressed the thanks of the Directors for the compliment paid to them, and the meeting separated.

Heywood Local Board Water-Works Arbitration.—This arbitration, which was referred to last week, was resumed on Thursday in London. It may be remembered that the principal question in dispute is with regard to the amount of compensation to be paid to Mr. Hutchinson, of Green Booth Mills, near Rochdale, for the water taken by the Heywood Local Board under their Act of 1877. Mr. Hutchinson claims £66,000. He has had his water reduced from an average of 7½ feet per second to 4½ feet per second, and is now claiming compensation for the loss. The points being raised are, first, the value of this water as power; secondly, the value of the alterations made at his mills so as to be enabled to work as he did previously; thirdly, the value of certain portions of land which he has lower down for erecting manufactories. The case was continued till Saturday, when it was adjourned till the 8th of December.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Half-Yearly General Meeting of this Company was held at the London Offices, Great Winchester Street, on Thursday last—D. T. EVANS, Esq., in the chair.

The SECRETARY (Mr. W. Marshall) having read the notice convening the meeting, the following report and statement of accounts were presented:—

Your Directors have pleasure in submitting to the Shareholders a statement of accounts, duly audited, for the half year ending the 30th of June last.

The gas and meter rental, as compared with the corresponding half of last year, has increased. The number of private consumers continues to advance.

There is an improvement in the sales of residual products, and the cost of production has decreased.

The loss upon exchange during the last half year has been severe, the remittances having been larger than usual. Your Directors have charged £3200 to profit and loss account, and have placed the balance (£2609 11s. 7d.) to debit of exchange equalization account, to be dealt with hereafter.

Since the last meeting, a Local Audit Committee has been appointed in Bombay, and entered on its duties on the 1st of October last.

The amount at the credit of profit and loss account for the half year is £3514 8s. 1d., out of which your Directors have declared an interim dividend of 3½ per cent. for the half year (free of income-tax), leaving a balance of £157 12s. 11d. to be carried forward.

The interim dividend will be payable on and after the 1st of December next.

General Balance, June 30, 1879.

Dr.				Cr.		
Capital authorized—(50,000 shares, at £5 each—£250,000.)				Construction account	£203,336	10 7
40,000 shares, £5 paid	£200,000	0 0		Exchange equilization account	2,609	11 7
10,000 shares, £4 paid	40,000	0 0		Retort account	1,775	3 7
	£240,000	0 0		Services account	95	15 8
Amount owing by the Company	985	3 10		Goods in transit	192	6 4
Reserve-fund (equalization dividend account)	3,435	18 5		Stocks, viz.—		
Reserve-fund (for depreciation of plant, &c.)	£3,315 11 7			Chandeliers, brackets, &c.	4,696	1 7
Written off	96 19 0			Brass and iron goods	5,097	12 6
	3,218	12 7		Mains, services, and tools	1,778	8 9
Insurance-fund*	1,853	9 9		Meters	2,945	5 2
Passage-fund	206	14 2		Coal	11,620	5 10
Balance to general revenue account	8,557	12 11		Residual products	127	11 9
				Amount owing to Company	4,794	5 1
				Cash at Bankers, on deposit, and in hand, viz.—		
				In Bombay. £3,393 14 0		
				In London. 621 19 3		
				Bank bills in hand	15,175 0 0	
					19,190	13 3
	£258,259	11 8			£258,259	11 8

* £1842 15s. of this amount since invested in £1800 Victoria Government 4½ per cent. Debentures (Railway Loan, 1878).

Profit and Loss Account.

Coal carbonized	£7,186	9 7	Gas and meter rental	£20,211	4 9
Wages	1,191	6 10	Coke, tar, fittings, &c.	3,620	15 3
Purifying	10	12 0	Interest	59	9 11
Maintenance of retorts	149	8 0			
Trade and general charges	674	17 4			
Salaries and Collectors commission	1,803	14 2			
Rents, rates, and taxes	410	0 9			
Directors and Auditors remuneration	676	5 0			
Bad debts	23	19 8			
Law charges	50	8 6			
Exchange account	3,200	0 0			
Balance	8,514	8 1			
	£23,891	9 11		£23,891	9 11

General Revenue Account.

Balance carried down	£8,557	12 11	Balance, Dec. 31, 1878	£9,643	4 10
			Less dividend paid July 1, 1879	9,600	0 0
				£43	4 10
			Balance for half year ending June 30, 1879	8,514	8 1
	£8,557	12 11		£8,557	12 11
			Balance for appropriation	£8,557	12 11

The CHAIRMAN, in moving the adoption of the report and accounts, said upon the occasion of the half-yearly meetings he did not usually, with the same minuteness, go through the figures in the accounts furnished to them as he did at the yearly meetings. The report and accounts were so copious, and furnished such an exact statement of the condition of the Company, and so effectually indicated its progress, that he need only make a few remarks on this occasion. It was satisfactory to find this progress, though it had not been rapid, had been steady. These were eventful times in commerce; and in Bombay, as in all other large centres of industry, there had been very considerable depression, and he thought it was matter to congratulate themselves upon that they had done as well as they had. He would not, as he had said, go through the figures *seriatim*, but would supplement them with some additional particulars which might be interesting to the Shareholders. In the first place, he would refer to the gas and meter rental, the residual products, and the fittings account. Now, they showed an increased profit of £826, which was not very large, but was certainly satisfactory. The cost of production and the working expenses had decreased, and that, again, was a very favourable feature. It was true that the decrease had not been large—it amounted to £300—but it was on the right side, and assisted them, as the increase in the gas-meter rental, the products, and the fittings accounts had done. As to the sale of gas to private consumers, he should tell them that there was a considerable increase in that direction, as was shown by the number of meters taken out. The quantity of gas sold for private consumption had increased, in round figures, by 700,000 cubic feet, and he was happy to say that it had gone on increasing down to the last date. The most serious matter which had affected them, and which still continued to affect them, was the loss on exchange. That loss had amounted to £5809 in the six months under review, or nearly £1000 per month, the amount brought home being £27,100, at an average of 1s. 7¾d. per rupee. He went into the matter of exchanges so fully at the annual meeting in May last that he need not further refer to it. The loss was unavoidable, and they could certainly have divided 3 or 4 per cent. more among the Shareholders if it had not been for that loss, which was, therefore, the more to be lamented. Their stock of coal which was a very material element for consideration, was sufficient for twelve months to come, and they would put this coal into their works at about the same low price as they had bought it at for some time past—say 36s. per ton. The Directors were very carefully watching the freight market. It was now rising, and, as reported from Calcutta in *The Times* of that day, the rise was 100 per cent. since the middle of last September. They were watching the freight market, because it was really more a question of freight than price of coal to the Company. He had to report that the works were in good condition, and as to the public lighting in Bombay, he read a paragraph from the last letter of Mr. Scott, their Manager, dated the 27th of October last, which he thought would be very reassuring and gratifying to the Shareholders. The extract stated that the Municipal Commissioner had, in his next year's Budget, provided for 88 extra gas-lamps, and that a good increase in private consumption might be expected on Malabar Hill; and another road, where the new mains were to be laid, would also be a very important one when the Prince's Dock was open. Perhaps the dock was now open, as it was in a very advanced stage when the letter was written, and he (the Chairman) might add that their Manager had been requested to furnish an estimate for lighting the dock. He thought that this was very satisfactory. He need hardly tell the Shareholders that they had sent out a telegram sanctioning the outlay for the mains, in consideration of the Municipality taking the 88 extra lamps. They would see that there was a considerable increase in the consumption expected from the road on the Malabar Hill and the district which would now be built on in that neighbourhood. He should also tell them that their Manager had furnished an estimate for the lighting of a large theatre which was now being fitted up. He considered that their prospects were very assuring. The price of silver and the exchange was rising, and that was in their favour, and he himself anticipated that between this and the beginning of next year the rupee would be—he would not say considerably, but it would be somewhat enhanced in value. That morning from Calcutta it was 1s. 8 13-16d.—that was 1-16d. more than 1s. 8¾d.

A SHAREHOLDER: That is the rate for four months bills, not cash remittances.

The CHAIRMAN said that was so. If they discounted a bill they received a little less. They held their bills, as a rule. They had at that moment more than £20,000 in their strong-box at the bank. They resorted to discount as little as they possibly could. It served their purpose to let the bills run out, and they were running out. The Directors, and he would say the Manager on the other side, did their best to reduce expenses. They had here a new office, at lower rent; in short, they were economizing in every way. He had further to announce that, acting largely on the representation of Mr. H. P. Stephenson, who had had much experience in the working of accounts in some foreign companies—the Malta and Mediterranean and others—they were changing their system of accounts, and were going to keep them at home, and this he believed would effect considerable economy. He therefore thought, all things considered, and taking note of the fact that the long and terrible wave of depression which had been passing over the trade of the world was now flowing by, they might look with confidence on the future. Mr. Stephenson reminded him of a fact he had not referred to. They had now an Audit Committee in Bombay—three gentlemen, all practical men—and they commenced their operations on the 1st of October. To the Directors this was very assuring, and he hoped that it would be so to the Shareholders. He would be very happy to reply to any questions, but would first move the adoption of the report and statement of accounts.

Major GORDON seconded the motion.

Mr. ALFRED PENNY said that so far as the accounts went there was very little to say except with regard to the highly important item of coal. He found that the stock of coal had been reduced to £11,620, from £18,747 in the previous half year, and £26,312 in the corresponding half year of 1878. His own impression was that it was a very unfortunate thing that at this time the stock of coal should be so much reduced, and he thought it would have been more to the interest of the Company if they had had some of the £20,000 that was in the strong-box invested in coal. That, however, was a matter for the Directors to deal with, and he had no doubt that they had good reasons for doing what they had done. Some Shareholders had rather complained when the stock was so large, and the Chairman had stated—which no doubt was the fact—that it was necessary and advantageous to the Company to have a large stock. He should, however, have thought that at the present time, when both coals and freights were advancing, it would have been better to have kept the coal stores full. Then there was another very important question, which he might term a burning question. It came before them every half year, and had come before them this half year in an intensified form—he referred to the loss by exchange. At the last meeting he made some observations on this subject, and stated that if the Company continued to lose by exchange at the progressive rate that had lately been experienced, there was no doubt that the reserve-fund would soon vanish, and the Directors would have to consider the course they would take. Either less dividend would have to be paid, or the rates for gas would have to be increased, if the same dividend was to be paid to the Shareholders that they had been in the habit of receiving. Well, they would see that this time last year £5000 was standing to the credit of the reserve-fund, but that was immediately decreased by some £1200 for what was called the equalization of exchange account, and at the last meeting a further sum was taken from it, reducing it to £3435 18s. 5d. Notwithstanding that they had charged £3200 to profit and loss for the current half year, they had to put £2609 to suspense; but really and truly it should have been charged against the reserve-fund, which would then have been diminished to £826. Now, they had made use of their reserve for the equalization of dividend account rendered necessary by loss on exchange, but it was very well known that this fund ought to be used for another purpose—that was, to provide against the increase in the cost of coal, labour, and other things, and any unavoidable expenditure that might happen. They had, therefore, nearly extinguished their reserve-fund by making up for a loss which he thought they ought boldly to face in another way. He admitted the right of the Directors to deal with all these matters in the way they thought best for the interests of the Company, but as a Shareholder he considered this matter a very serious one. If there was one undertaking that had fewer elements of speculation in it than another, it was, in his judgment, a gas undertaking. Those who held shares in many gas companies probably found their dividends came to them pretty regularly, and that there was no element of speculation in them; but what must be the feeling of Shareholders in this Company, who found that there was a profit to be divided of between £11,000 and £12,000, and that there was a sum amounting to nearly £6000, which was an element of speculation, to be deducted for loss by exchange. They had put before them as the receipts for gas £20,211, and for residuals £3620 sterling. But was it sterling? It was £23,831 brought out by calculating the rupee at 2s. He had no doubt that, as a matter of account, the result would be precisely the same, whether they took the rupee at 2s., and incurred a large loss by exchange, or whether they altered their par of exchange to something that more resembled the real condition of things.

The CHAIRMAN: It is impracticable; it is so shifting.

Mr. PENNY said that supposing, for example, the par of exchange was taken at 1s. 8d., instead of £20,000 for gas they would show receipts less in proportion, but instead of the Shareholders being surprised and shocked, as he might say, by seeing a loss of £6000, they would reduce this apparent loss to a very manageable amount; and if the exchange should improve and be 1s. 9d., instead of their having, as they had now, a large sum of loss by exchange, they might have on the other side a profit by exchange, and they would eliminate from the accounts that element of speculation which he thought so objectionable. Why should they say they had received £20,000 when they had only received 200,000 rupees, worth only from 1s. 6d. to 1s. 9d. each? He knew there was a difficulty in in-

creasing the price of gas, and he was not advocating it. By the present method of valuing the rupee they had to put into the accounts an acknowledged loss of nearly £6000 for the half year, and it came to precisely the same thing so far as the figures went; but he ventured to think it would be more satisfactory, to some of the Shareholders at all events, if the Board would take another par of exchange—say 1s. 8d.—and then if the exchange improved they would have an opportunity of getting whatever profit there was, and calling it profit instead of loss on exchange, and gradually work their reserve-fund up.

The CHAIRMAN, in reply, said with regard to the question raised by Mr. Penny, the loss would be the same—£6000—whether they kept the amount in rupees or in sterling.

Mr. PENNY: Quite so.

The CHAIRMAN: And let me add this—that all the great Indian banks find it necessary to keep their accounts in sterling. Not one Indian bank could be mentioned, so far as he knew, that kept its accounts in rupees, and the banks had very great experience.

Mr. PENNY observed that it was a matter for the Directors to deal with. Personally he was dissatisfied at finding so large a sum standing as loss, and witnessing the reserve-fund vanish away. It had really all gone but £800. As far as regarded the working of the concern and the accounts, looked at from a professional point of view, he was entirely satisfied.

Mr. WILDEY thought the previous speaker could not have had much experience of Indian companies. The exchange so varied that they could never take one month with another. The result of the half year would be the same, whether the exchange was calculated at the rate of the day, or was taken at 2s. Whether it was quite proper to go on paying the same dividend, and charging the loss against the reserve-fund, was another matter altogether; and there he must say he had some little doubt whether they had not been rather imprudent in giving so much dividend, and carrying so much to debit of reserve-fund, but really it was a matter on which the Directors must exercise their discretion. The price paid for the coal was 36s. per ton. Was that taking it at 2s. per rupee?

The CHAIRMAN: Yes.

Mr. WILDEY said in the Bombay and Baroda Railway Company they contracted to have their coals delivered free there, and they found that that had been to their advantage. They had nothing to do with freights.

The CHAIRMAN said the experience of this Company had been the other way. Mr. Wildey had asked the difference between the cost of gas coal and Welsh steam coal. The price of the best Pelaw Main coal was 7s., and Welsh steam coal was from 9s. to 10s.

Mr. W. B. M. LYSLEY said if they looked at the accounts they would see that the reserve-fund was specified as equalization dividend account, and therefore the Shareholders could not be astonished at the Board using that sum for what it had been intended for.

Mr. WILDEY said it was only a question of prudence—whether it was prudent to swallow it all up. He thought the increase in gas consumption was very satisfactory, but was rather surprised that the residual products came to so small an amount.

The CHAIRMAN said the returns from them advanced or fell according to the price of coal.

Mr. WILDEY said of course they did their best to obtain the highest price. As to the question of stock of coal, it was a very difficult one; but as to the possible increase in the price of coal at present, and, therefore, the argument that the Directors should have sent out more, the other view was that the coal deteriorated, and they had the interest on the money which would otherwise have been laid out on coal.

Mr. NORTHOVER referred to the varying rate in the exchange. He did not see how the Company were to alter their accounts in any way now. The only thing would be to wipe off the whole of the loss, when the reserve-fund would stand as Mr. Penny had stated. But there was now an improved rate of exchange, and he thought they ought not to pay in one year for all their adversity.

Mr. PENNY, in reference to some remarks made by a Shareholder, said he hoped the meeting would not suppose he was so foolish as to suggest the Company should keep their accounts on the fluctuating rates of the day. His idea was to reduce the par rate of exchange in the Company's books from 2s. per rupee to 1s. 8d. *permanently*, as it was simply a delusion to continue to estimate their rupees at 2s. each, when the real value was so much less.

Mr. H. P. STEPHENSON said with regard to the stock of coal kept, the Directors could congratulate themselves on this—that whether they kept a large or a small stock, they had objections raised to both courses. Their system had always been to take low freights when they could get them, never to press the market, and never to go in for high freights if they could avoid them. Acting on that, and the recommendation of their Manager that they should not keep such a large stock in Bombay, they had in the present balance-sheet reduced the quantity in the manner shown. But that had been increased by 3000 or 4000 tons since the date of the account. As to the question of exchange, it was a very difficult one, and had given the Directors a great deal of anxiety. He thought the view put before them by Mr. Penny was a very reasonable one—a very sound and a very safe view; but what did it inevitably lead to? An immediate reduction of their dividend. If they had taken 1s. 8d. as the par of exchange for the rupee, they would have had to be contented with a less dividend, because their profit would not have come out so much at the present moment. They were extremely anxious to keep up the present rate of dividend as long as they fairly could, and they thought it very unadvisable to increase the price of the gas. They had begun the system of lowering it, and they believed that that was a good system. As to the reason why they had not written off the £2600 this half year, it was an interim meeting, and the proportion of money they brought home in the June half year was very large as compared with the amount brought home in the December half year. They were able to deal with the accounts in the December half year. Every year they had written off from the reserve-fund. They had not carried the suspense account beyond the year, but in several June half years they had carried a suspense account, waiting to deal with the whole question at the end of the year; and they considered, too, that this half year a very exceptional amount had been brought home. In the six years from 1874 to 1879 they had lost £22,840 by exchange. When he said loss, it was the difference between 2s. and the rate at which they had brought over the money in bills. If they had kept their accounts at the par of 1s. 8d., that loss would not have been shown, but it would have existed all the same; so that keeping the par at 1s. 8d. or 2s. made no difference. He would now show them the amounts remitted, and the respective losses they had had by the exchange in the periods he had mentioned. In the June half of 1874 the sum remitted was £33,500, and the loss by exchange was £653; in the December half of 1874 they remitted nothing and lost nothing; in June, 1875, the sum remitted was £26,700, and the loss was £1628; in December, 1875, they remitted £3500 and lost £309; in June, 1876, they remitted £38,000 and lost £5558, but in the following December they remitted nothing and lost nothing; in June, 1877, they remitted £31,000 and lost £2814, while in December, 1877, they remitted nothing and lost nothing; in June, 1878, they remitted £27,000 and lost £3783; in December, 1878, they remitted £12,000 and lost £2281; and in June, 1879, they remitted £27,173 and lost £5811. He believed that in the current half year their remittances would not be anything like that amount, and he felt that at the end of the year they would be in a very much better position to deal with the question, having all the figures before them, than if they actually wrote it off from the reserve-fund in the present half year. That was the course they had adopted on previous occasions, and, he believed, with the approval of the Shareholders generally, and he thought they had acted wisely on the present occasion. That was the reason which had guided them in this matter. It made no difference to the accounts. They had £2600 in one hand and the reserve-fund in the other. Whether they wiped off that £2600 and reduced the reserve-fund it made no difference in the accounts; but they thought they could deal with it better at the end of the year.

Mr. LOVEJOY asked the meaning of the item, "Interest, £59."

The CHAIRMAN said it was the interest they had received on the money they had on deposit at Bombay, less discounts on this side.

Mr. LOVEJOY said that on the debtor side of the general balance-sheet they had two reserve-funds—one for equalizing dividends, and the other for depreciation of plant. The word "reserve" meant, he thought, something they could lay hold of; but if it was used in the concern, how could they do so?

A SHAREHOLDER: You have the use of the capital.

Mr. LOVEJOY said he was speaking of the word "reserve," and if it was a reserve it ought to produce some interest. Then there was a fund called the "insurance-fund"—£1855. That seemed to be invested in 4½ per cent. debentures.

The CHAIRMAN said it had only just been so invested, and they had received no dividend on it.

Mr. STEPHENSON drew attention to the foot-note, stating that £1842 of the amount had since been invested—meaning since the date of the accounts.

The CHAIRMAN said that the interest they had received on money on deposit at Bombay in the six months was £255. Against that they set off the sum they paid for discount in London—£196—showing a balance of £59, as given in the profit and loss account.

The motion was then put, and carried unanimously.

Mr. NORTHOVER moved a vote of thanks to the Directors and the staff generally for the services they had rendered the Company. He trusted when they next met they would present even a better account than they did on that occasion.

Mr. R. KING seconded the motion, and it was carried unanimously.

The CHAIRMAN, in reply, cordially thanked the Shareholders on his own behalf and that of his co-Directors. They were working zealously and diligently in the interests of the Company, according to the best of their judgment and discretion, and would continue to do so.

The proceedings then terminated.

BIRMINGHAM CORPORATION GAS SUPPLY.

A Special Meeting of the Birmingham Town Council was held last Tuesday—the MAYOR (Mr. Richard Chamberlain) presiding—when the Gas Committee's report was presented, which stated that it had become necessary to provide a new gasholder at the Swan Village works, in substitution for gasholders about to be abandoned. The Committee had therefore instructed their Engineer to prepare plans and specifications for a holder to contain about 2 million cubic feet of gas, and they now recommended that they be authorized to proceed with the work at an estimated cost of £35,000. The report then continued: In May last the water in the gasholder-tank at Jervoise Street, West Bromwich, was found to be rapidly sinking. As it was apparent that some accident had happened to the tank, the gas in the holder was worked and blown out as quickly as possible, and the tank emptied by pumping. It was then found that, owing to the renewal of mining operations in the neighbourhood, the floor of the tank had been broken in several places. Complaints having been made by the owners and occupiers of the property in the neighbourhood that the water from the tank had leaked into the surrounding wells, arrangements were immediately made to give the occupiers of the houses in question a daily supply of water from the Corporation premises. Notice has since been given to the Committee on behalf of the owner of a cottage in Jervoise Street, that he claims certain penalties which it is alleged he can recover under the Act of the Staffordshire Gaslight Company of 1845, and a writ for the recovery of £920, the amount of these penalties, has been issued. The Committee stated that they felt it was their duty to resist any attempt to obtain the payment of penalties which were far beyond the amount of any damage sustained; and they recommended that they be empowered to take the necessary proceedings to defend the action. Eight other similar claims had been made by owners of wells in the neighbourhood, six of which had been settled by the payment of small sums as compensation. The sale of gas for the quarter ended Sept. 30 had been 371,112,700 cubic feet, as against 357,734,400 cubic feet in the corresponding period of the previous year, being an increase of 13,378,300 cubic feet. The number of new services supplied last quarter had been 648, being a decrease of 70 as compared with the corresponding period of the previous year. The average illuminating power for the same period, as certified by the official tester, was 17·21 candles. The number of cooking and heating stoves and gas fires supplied by the department had been 152. The yards at Adderley Street, Windsor Street, and Swan Village had been clear of coke for several weeks past, while the stock at Saltley had been largely reduced. The stock of coke was now less by 18,000 tons than at the corresponding period of last year. The Committee were glad to be able to report that the improvement in the town trade continued, and that, with the revival of the South Staffordshire iron trade, there was every prospect of their keeping the yards clear during the coming year.

Alderman CHAMBERLAIN, M.P., moved a resolution authorizing the Gas Committee to expend the sum of £35,000 in the provision of a new gasholder at Swan Village. He explained that the Committee had abandoned sundry small holders at Swan Village, which provided for a certain amount of storeage. When they took to the works at West Bromwich the storeage, even when used to its full capacity, was below what was required for the make of the works, which was now about 2¾ million cubic feet per day, and the storeage was of about equal amount. The storeage after the abandonment of these holders, was only about 1 million cubic feet, and, therefore, the Council would see that it was absolutely necessary, so long as the works continued in operation, that they should increase their storeage by 2 million cubic feet; and it was a holder of that capacity which they asked the Council's leave to erect. They had applied to eminent engineers, and had made many inquiries as to the best site for the holder, but they had failed to get any land in the neighbourhood which was absolutely outside the risks of mining accidents. They had found, however, on their own property, a site where all workings had for a considerable time ceased, and where danger of any similar accident to that which had recently happened was infinitesimal.

Mr. J. E. BAKER seconded the motion.

Mr. BEARD asked if the proposed new holder at Swan Village would be required for supplying gas to Birmingham after the outlying Local

Boards, four of whom were erecting gas-works for themselves, had taken over the supply to their own districts. If not, he did not consider the outlay of £35,000 was necessary; whereas, if it was proposed afterwards to use the gas made at Swan Village for Birmingham, he should raise an objection to it, because he thought it would be far better to make gas at Birmingham instead of there.

Alderman CHAMBERLAIN, in reply, said the Gas Committee during the next two years were under an obligation to supply the West Bromwich district with gas. If they left it in darkness they would be subject to serious liabilities, so that really they had no choice in the matter. When the Local Boards left them, then would be the time to come to the Council and say what the Committee proposed to do with the works.

The motion was carried.

Alderman CHAMBERLAIN then moved that the report of the Gas Committee be approved. He said the sale of gas had slightly increased last quarter, and pointed out that a considerable reduction in price did not necessarily bring with it a large increase in consumption. When gas was as cheap as in Birmingham, a slight alteration in price must not be expected to recoup itself by any particular increase in the demand. The amount of the demand depended upon questions of good or bad trade, and also in a great measure upon the temperature during a given quarter. It would be satisfactory to the Council to know that the coke difficulty, which had pressed upon the Committee so long, had now been entirely removed. The yards were cleared of all coke, and they were beginning to get rather a better price for that residual. Although he could not expect much more this year, he hoped that next year they might get something like a reasonable return for what, after all, was one of the largest results of gas-making—always excepting the gas itself. He might also tell the Council that the improvement in the chemical trade, noticed by a high authority, had been a distinct advantage to the Council. The price of ammonia was going up rapidly, and this, he hoped, would also increase the profits of the Gas Committee.

Mr. THOMPSON said that, as the price of coke was rising, and coals were being purchased more cheaply, he should like to know whether there was any prospect of the price of gas being reduced.

Alderman CHAMBERLAIN, in reply to the above and other questions, said that when he pointed out to the Council that the Gas Committee were doing better, he meant it to be understood that their contracts for coke were made at the lowest prices, so unless there should be a startling change in trade, he did not think there would be a reduction in the price of gas at present. With regard to leakage, there had been a very marked improvement, probably not less than from 2 to 3 per cent. since the Corporation had taken to the business, the pressure of the gas being less. They had by a re-arrangement of the mains, been able to give the same pressure to the consumers with much less initial pressure at the works than used to be given under the Companies, and that involved, as every practical engineer knew, a considerable saving of gas. With regard to guarantees and deposits, the system under the Corporation was very much more lenient than that under the late Companies, and he was sorry to say that as a result they were making more bad debts with regard to small consumers. By the trust they now gave they lost considerable sums of money, but they had thought it better to do that than to create irritation by being too stringent. All that they asked for was that a deposit equal to the winter 's consumption should be made, or a guarantee given for that amount in respect to improved systems of street lighting, the Committee had made a great many experiments, but up to the present time they had not seen any kind of burner or lamp which they thought would thoroughly satisfy them or the people of Birmingham. Experiments had been tried in Bristol and Paris. The Committee had made themselves acquainted with the plan adopted in the Rue du Quatre Septembre, and that was, in his opinion, the perfection of gas lighting. They had ordered some lamps of the same kind to be brought to Birmingham, and they would be tried in the Old Square, and if they gave as much satisfaction generally as they had to him and other members of the Committee who saw them in Paris, he thought the inhabitants of Birmingham might consider that they had found what they requied.

The report was then adopted, and the other business of the Council was proceeded with.

HINDLEY LOCAL BOARD GAS SUPPLY.

LOCAL GOVERNMENT BOARD INQUIRY.

Last Tuesday, Major HECTOR TULLOCH, one of the Inspectors of the Local Government Board, held an inquiry with respect to an application of the Hindley Local Board for authority to borrow £43,000—viz., £36,000 for street improvements, £6000 for gas purposes, and £500 for fire brigade purposes.

The INSPECTOR commenced the inquiry by asking if the Board were paying their debts now, as the last time he was at Hindley they had not made any arrangements to do so.

Mr. S. HOLT (the Clerk of the Board) said that they were now doing so. Since the Inspector's last visit, the Board had commenced a sinking-fund, so that the sums borrowed would be liquidated within the time specified for their payment.

The question of the loan for street improvements was first gone into. On the subject of the proposed borrowing powers in respect to the gas-works,

Mr. HOLT, in reply to the Inspector, said the works were bought from a private company in January, 1873, and since then the Board had almost entirely remodelled them, with the exception of the holders. The whole of the money they wished to borrow was owing. The works were bought by the Local Board for the sum of £25,000, and at the end of the first year, through the cost of promoting the Bill in Parliament, the law charges, and the loss on the manufacture of gas (amounting to £657 0s. 6d), their capital account was increased to £32,160 11s.

The INSPECTOR: But you cannot add the loss on the manufacture of gas to capital account. You ought to have recouped yourself by charging more for your gas next year.

Mr. HOLT said that was a matter which had been before the Board on several occasions. The capital account had since been increased to £52,035 13s. 7d. by the addition of plant, mains, service-pipes, &c. There had been a loss on the manufacture of gas as follows:—1873, £651 0s. 6d.; 1874, £1300 19s. 10d.; 1875, £833 17s. 1½d.; 1876, £477 0s. 5d.; 1877, £685 5s. 10d.; and in the 15 months, from Jan. 1, 1878, to March 25, 1879, £204; making a total loss of £4152 3s. 8½d. during the period the Local Board had had the works. This loss, of course, had considerably reduced the amount at their disposal for carrying out extensions.

The INSPECTOR: Have you been paying for this loss out of the capital?

Mr. HOLT: Yes.

The INSPECTOR: Do you see the effect of this? You are laying a burden on those who are to follow.

Mr. HOLT said the Board had been informed of the loss, but they had never been able to agree to increase the price of gas to the maximum, which was 5s. per 1000 feet, being of opinion that if a little time was allowed, the works would pay off this loss without the price of gas having to be raised. The members of the Board thought, and no doubt with reason, that the raising of the price would reduce the consumption, and thereby prevent them being a success.

A RATEPAYER asked what the price of gas was.

Mr. PENNINGTON (Chairman of the Local Board) said that it was 4s. 6d. per 1000 feet.

Mr. HOLT, continuing, said the Inspector would find that the amount of loss was yearly diminishing, and next year the Board were hoping that, by economical working and a favourable coal contract, there would be not only no loss, but an actual profit. They were yearly expecting the works to improve, and thereby enable them to clear off the loss.

Another RATEPAYER asked who was deriving the benefit. It was, he thought, the large consumers; at any rate, it was not the smaller ones.

Mr. PENNINGTON said it was in proportion.

The INSPECTOR (addressing Mr. Holt): Then this loss of £4152 3s. 8½d. is part of the £6000 you are wanting power to borrow? It is absurd to ask the Local Government Board to sanction a loan to cover a loss which you ought to have recouped by raising the price of gas. You paid £25,000 for the works, and you have spent something like £20,000 on them since. What have you built?

Mr. HOLT: We have built a large retort-house, and erected new retorts.

The INSPECTOR: There has been a loss of £4000 odd, which you have put to capital account, and you think it time now to come and make application for a loan?

Mr. NICHOLSON (one of a deputation appointed at a meeting of ratepayers held the previous evening to protest against the action of the Local Board): I believe the gas consumers have now lost all confidence in the Board, and really believe they can never make the works a success.

Mr. PENNINGTON: When the Board took over the works from the Gas Company the mains and plant generally were in such a shocking state that they had to be almost entirely renewed. The Company had been making large profits, but they had been paying dividends out of their capital.

Mr. SHUTTLEWORTH (a member of the Board): They obtained £25,000 for their works, which were certainly not worth £10,000.

Mr. GRIME (another of the deputation): Mr. France, of Wigan, bid £30,000 for the works, so that there is not much force in Mr. Shuttleworth's statement.

The INSPECTOR: I see that section 12 of the Board's Act empowers them to borrow £20,000.

Mr. HOLT: In the first Act we had authority to borrow £40,000.

The INSPECTOR: How many Acts have you?

Mr. HOLT: Two. Under the first Act we had power to borrow £40,000, and under the second £30,000.

Mr. PENNINGTON: Yes; but under the last Act we could only borrow with the consent of the Local Government Board.

Mr. HOLT, in reply to further questions, said that under the Act of 1872, the Board spent upwards of £40,000, and then applied for £12,500; of which sums £25,000 went in buying the gas-works, and the rest in extensions. The extensions were made under the powers of the second Act. At the inquiry preceding the granting of the last application for borrowing powers it was stated that of the amount applied for, £2500 was required for offices and stables. The latter had been built, but not the offices.

The INSPECTOR: You have not spent the £12,500 as sanctioned?

Mr. PENNINGTON: There was a loss on the gas supply, and that accounts for it.

The INSPECTOR: I am sure some of you gentlemen are concerned in large works of your own; and I am quite as sure you do not keep your accounts in the way the accounts of the Local Board are kept. If you do, I feel certain you will find yourself in a very curious position. When I was here before, you applied for the loan of £36,000. I recommended that sanction should be given for borrowing a portion of that amount for works required to be carried out at once. Now I find you make application for some of the works sanctioned on my recommendation when I was here before. You could only once have done the works—the fitting up of retort-houses, retorts, boiler-houses, &c. You could not have two renewals.

Mr. HOLT: The retort-house was estimated to cost £850, but actually cost £2086.

The INSPECTOR: What is the total sum that you have borrowed for gas purposes?

Mr. HOLT: £52,400.

Mr. BEAZER (another of the deputation): That is £100 more than the rateable value of the township.

The INSPECTOR: How has the money been expended?

Mr. HOLT: The gas undertaking cost £25,000. We paid the Corporation of Wigan for mains, £2008 19s. 8d.; for parliamentary charges, £4321 15s. 8d.; law charges, £178 15s. 2d.; loss in the first year, £651 0s. 6d.; total for the year ending 1873, £32,160 11s. In 1874 there was spent in extensions, £3504 16s. 11d.; law charges, £63 2s. 11d.; loss for the year, £1300 19s. 10d.; total up to 1874, £37,029 10s. 8d. In 1875 the extensions and alterations cost £2106 7s. 10½d.; parliamentary expenses in getting the Act of 1875, £250; loss for the year, £833 17s. 1½d.; total up to 1875, £40,219 15s. 8d. In 1876 there was spent in extensions, £3997 18s.; law charges, £88 4s.; loss, £477 0s. 5d.; total up to 1876, £44,782 18s. 1d. In 1877 there was spent in extensions, £3214 19s. 4d.; loss for the year, £685 5s. 10d.; total up to 1877, £48,683 3s. 3d. From Jan. 1, 1878, to March 25, 1879, there was spent in extensions, £3148 10s. 4d.; loss for 15 months, £204; total up to 1879, £52,035 13s. 7d. That was the amount of our capital account on the 25th of March this year.

The INSPECTOR: Have you spent anything since?

Mr. HOLT: About £190 18s. 2d., which makes a grand total of £52,226 11s. 9d.

The INSPECTOR: When I came here in May, 1876, you gave me an estimate of the works to be carried out—of the works that were important and could not be delayed—and these amounted altogether to £12,753. I find from the statement that you have now given me that since 1876 you have only spent £7000 of the amount you were authorized to spend. Is that so?

Mr. HOLT: Yes. When you were here a lot of these items were nearly completed.

The INSPECTOR: You did not tell me that at the time.

Mr. HOLT: They were works that could not be delayed, or the town would have been in darkness.

The INSPECTOR: Do you say these works have been carried out?

Mr. HOLT: The bulk of them.

The INSPECTOR: Where have you found the money?

Mr. HOLT: Out of the £12,500.

The INSPECTOR: It seems to me that you go on spending money without estimates or anything, and then suddenly pull up when you find there is a large balance against you. Then it occurs to you to make application to the Local Government Board for a loan, and you make up any sort of a story so as to get it. Some of the works have been carried out before you apply, and some have not, and some of the amount asked for consists of a loss on the working. This estimate no more represents £6000 than it represents any other portion of the gas-works capital of £52,000. It is only

something to make up an amount of £6000. Since I was here in 1876 the parliamentary expenses and loss have been charged to capital.

An inquiry as to the proposed loan for fire brigade purposes was then made by the INSPECTOR, who afterwards invited observations from any ratepayers present.

Mr. BEAZER: With regard to the first subject, the ratepayers are opposed to the granting of any loan whatever, on the ground that the borrowing powers of the Board are now equal to about three times the rateable value of the township; and the money actually borrowed is more than double the rateable value. The amount already borrowed is equal to a 2s. rate. I think if a poll were taken of the ratepayers our opposition would be confirmed.

Mr. WALLS: Nineteen out of every twenty of the ratepayers would vote against the Local Board's application.

Mr. KIRKPATRICK: We think if a loan is granted care should be taken to see that it is spent for the purpose for which it is granted.

The INSPECTOR: I think that in such a case as this the Auditor should be informed to keep things in the right channel.

Mr. WALLS: It never has been hitherto.

The INSPECTOR: I do not think you need say more, but I can assure the members of the Board that they may find themselves in a serious difficulty. It will be my duty to point out to the Local Government Board the necessity of informing the Auditor what loans are granted, and the specific purposes for which they are allowed. If the members are surcharged it will be their own fault. When I was here before I advised them what to do; but if they take no notice of what is said they will have nobody to blame but themselves. I can assure them it is rarely I come to a town where the accounts are kept in such a way as here; and it is altogether a farce to come down and hold inquiries when the money asked for has been already spent. It is a matter entirely for the Board; but what has taken place it will be my duty to report to the Local Government Board, who, at all events, will have to let the Auditor know what loans are sanctioned, and for what specific works, with a view to him seeing that the money has been spent on those works.

The inquiry then terminated.

DONCASTER CORPORATION GAS-WORKS.

At the Meeting of the Gas Committee of the Doncaster Corporation on Friday, the 14th inst., the accounts of the department for the twelve months from Sept. 1, 1878, to Aug. 31, 1879, were passed. They show that the outlay on the works to Aug. 31, 1878, was £41,530 7s. 1d., and during the succeeding year, £482 8s. 9d. was expended in extensions—viz., £316 17s. 3d. for works, and £165 11s. 6d. for mains—this sum being made a charge against the revenue. The receipts for gas and meter rents were £9100 7s. 2d.; for residuals, £2361 14s. 1d.; sundries, £147 10s. 1d.; and deposits, £172 14s. 6d.—making a total of £11,782 5s. 10d. The expenditure included £4940 11s. 8d. in the gas-making department (£3014 10s. 10d. of which was for coals, and £1553 15s. 7d. for wages); £461 14s. 3d. in the lamp department; £210 0s. 7d. in the meter and fitting department; £774 4s. 0d. for repairs and wear and tear; and £915 11s. 5d. for salaries, rates, taxes, &c. The balance, therefore, carried to net revenue account was £4480 3s. 11d. Of this amount £250 was devoted to the paying off of bonds; £1000 was transferred to the general account of the Corporation; £2076 10s. 4d. was paid to the Corporation, being 5 per cent. on the capital expended on the works; and £175 was charged for bankers commission and interest; besides the before-mentioned amount of £482 8s. 9d. the cost of extensions during the year.

The following table will show the progress made in the gas supply since 1861:—

Year.	Receipts.	Payments.		Interest Paid to Corporation.
		On Revenue Account.	Extension of Works.	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
—	—	—	17,266 5 8	—
1861	6,380 5 10	4,436 7 9	1,579 0 0	289 8 0
1862	6,956 4 0	4,888 19 3	5,075 14 6	289 8 0
1863	6,509 19 3	4,485 11 2	886 11 8	289 8 0
1864	7,600 1 8	5,015 4 0	1,180 7 5	289 8 0
1865	8,341 13 7	5,706 12 9	529 15 6	289 8 0
1866	8,576 19 8	6,226 2 5	555 16 4	289 8 0
1867	7,894 15 10	6,047 11 9	546 11 9	289 8 0
1868	7,483 10 4	6,168 3 5	803 18 9	289 8 0
1869	7,875 9 0	5,625 1 10	1,396 8 3	289 8 0
1870	8,397 0 4	6,237 7 3	1,837 3 0	1,000 0 0*
1871	9,777 16 0	6,503 3 0	901 14 9	1,582 8 0 600 0 0†
1872	9,241 1 2	6,763 10 2	1,340 9 6	1,627 10 0
1873	9,952 19 3	8,596 4 0	788 7 9	1,694 11 8
1874	11,379 18 5	8,869 13 8	438 0 4	1,733 9 0
1875	10,893 2 6	8,813 3 10	881 16 0	1,755 17 0
1876	11,434 3 0	8,551 5 7	1,795 19 6	1,799 19 0
1877	11,858 6 9	8,927 6 1	2,839 18 7	1,889 15 0
1878	12,030 17 11	7,259 16 4	895 7 10	2,031 15 0
1879	11,782 5 10	7,302 1 11	482 8 9	2,076 10 4 1,000 0 0†
			42,012 15 10	

* Bonus for years 1869 and 1870. † Bonuses.

MIDDLETON AND TONGE IMPROVEMENT COMMISSIONERS GAS SUPPLY.—The Middleton and Tonge Improvement Commissioners having made application to the Local Government Board to partially repeal, alter, or amend by Provisional Order the Middleton and Tonge Improvement Act of 1861, so far as regards the repayment of money borrowed for gas purposes and the redemption of the gas annuities granted thereunder, Mr. C. N. Dalton held an inquiry last Tuesday in reference to the application. Mr. Robert Jackson, who appeared on behalf of the commissioners, said they were willing to agree to pay off the loans borrowed on the gas account in 60 years from the time of borrowing. The amount now paid annually to gas annuitants was £2558 16s., and that capitalized at 25 years purchase would amount to £63,975. Towards this the Commissioners proposed to set aside £86 13s. 4d. per annum as a sinking-fund. In reply to Mr. Dalton, Mr. F. Entwistle (the Clerk) said the present commissioners rates on the township were 2s. 6d. in the pound, and the poor-rate 2s. in the pound, making a total of 4s. 6d. in the pound. Mr. Dalton said in the event of a revival of trade more gas might be consumed, and a profit made. In that case they might set more money aside for the redemption of loans. Mr. Jackson said he did not object to this being permissive, but he did not at all like the idea of a compulsory clause being inserted to that effect. At present the Commissioners had borrowed to the extent of their powers, and it was in contemplation to erect a new gasholder. Mr. Dalton said he would report to the Local Government Board, but the present was certainly a bad time for dealing with such matters. They did not like granting more than 50 years for the repayment of gas loans.

EXPLOSION AT THE BRADFORD CORPORATION GAS-WORKS.

At an early hour on Saturday morning an explosion of gas occurred at the Thornton Road Gas-Works of the Bradford Corporation. About half-past three o'clock a loud noise was heard, and a shock, which is described as resembling that of an earthquake, was felt, the whole of the locality becoming illuminated. The cause was an explosion, succeeded by a fire at the gas-works. The fire brigade were called to extinguish the flames, and it was a task of greater difficulty than usual, because of the large quantity of gas that was escaping; but when once the gas had been cut off, the fire was soon put out. The scene of the explosion was the purifying-house, in which there were employed at the time two men—William Holt, a stoker, and Samuel Ryder, a labourer. While at work these two men noticed that the smell of gas was much stronger than usual, and they thought it must arise from a leakage. They removed a portion of the floor, and heard a rushing noise. Ryder lowered his lamp into the hole, and an explosion was the result. Neither of the men has any recollection of what happened afterwards, except that Holt remembers he was projected to a considerable height, and that when he fell to the ground he saw Ryder prostrate near the hole from which the gas escaped. They were both much injured, and Holt has since died. As an indication of the force of the explosion, it may be stated that several persons who reside at a distance of two or three miles from the works heard the noise. Near the works is a block of cottages known as Gas-Works Row, and the whole of the windows of these were broken, and similar damage was done at the Eagle Melange Works, which are on the opposite side of the road. At the gas-works the damage to property is considerable, being between £6000 and £7000. The purifying-house was entirely demolished, and the Gas Supply Committee held a special meeting later in the day, to consider what course should be adopted to put the place into working order with as little delay as possible. As a matter of course, the gas supply of that part of the town was greatly interfered with, and on Saturday night it was very inadequate to the demand. In a large number of shops the gaslight was so feeble that candles and lamps were used; but nowhere was the inconvenience greater than at the Town Hall, the police department especially having a most sombre aspect by candle-light. This inconvenience, however, is not likely to be of long duration, as the several gas-works owned by the Corporation are connected, and Mr. D. Swallow, the Manager, has received instructions to have the purifying apparatus, which was being made for the new gas-works at Birkshall, completed as quickly as possible, and placed in the Thornton Road works.

Later accounts state that a lamentable accident has happened in removing the wreck caused by the explosion. While a number of men were at work on Sunday afternoon clearing away the *débris*, a large stone fell upon one of them, named James Carlin, and so injured his head that he died on the way to the infirmary.

TUNNEL OUTLETS FROM STOREAGE RESERVOIRS.

At a Meeting of the Institution of Civil Engineers last Tuesday, a paper with the above title was read by Mr. C. J. WOOD, M. Inst. C.E.

The subject was divided into the consideration of culverts in a direct line through an embankment, and tunnels round the end of the embankment as a distinct work. The Author stated that the practice of laying pipes through an embankment, governed by valves at the foot of the outer slope, was reprehensible, and had been abandoned for a culvert of masonry or brickwork, in which the supply-pipes were laid. This method was not satisfactory, first, because of the settlement of the earthwork; and secondly, because of the subsidence of the puddle, both of which were likely to damage the culvert and create leakage. In crossing the puddle trench, a stone or brickwork pillar had sometimes been used with partial success to remedy this difficulty, and in other cases, a "slip joint" had been made of the portion of the culvert crossing the trench, to allow a slight vertical movement. In consequence, however, of the uncertain settlement of the earthwork of the sides of the embankment, this movement might not be vertical. The advantages of a culvert through the embankment were speed, economy, and the building of the culvert in daylight. These culverts were frequently surrounded by a coating of concrete, which gave additional security. The study of culverts under high railway embankments was suggested, and the Author believed it best, if possible, to leave the bank intact, by an alternative method—that of driving a tunnel round or under the end of the embankment in the solid rock as a separate work, the tunnel to be lined with stone, brick, or cast-iron segments backed with concrete. The objections to this plan were stated to consist in the work having to be done in comparative darkness; in the possible displacement of the natural strata of the ground, producing a creep of water outside the tunnel; and in the difficulty of backing the crown of the arch satisfactorily. The expense was in favour of the culvert directly through the embankment. The tunnel, though more costly, was safer, as it was not in the most dangerous place. The draw-off valves, placed in earlier examples at the foot of the outside slope, which prevented necessary repairs, were now frequently at the bottom of a valve-pit built on the inside of the puddle trench in the embankment. These valve-pits were liable to get out of the perpendicular, and prevent the valve-rods working; also the water went half way through the bank in the inner culvert. The draw-off valve was sometimes placed at the foot of the inner slope. It had a sloping face, and was worked by rods up the inside slope. The drawbacks were that stones were apt to settle; that there was great thrust on the valve-rods; that there was a want of access to the valve in case of accident; and that the least cleanly water was drawn off. A culvert terminating in a valve-tower of masonry or iron was the best plan, the valves being in duplicate, one set inside, the other outside the tower. The Author advocated the tunnel clear of the embankment and valve-tower as the best and safest, if the more costly plan.

Some remarks followed on the works for the supply of water to Bradford, Yorkshire, which was obtained from three districts. A high-level supply was taken from the hills above Oxenhope; an intermediate supply from Manywell Springs; and a low-level supply from Skipton district. The high-level reservoirs afforded instances of tunnel outlets. The Stubden reservoir had been a cause of anxiety, the original culvert of masonry proving leaky. It had been abandoned in favour of a tunnel lined with cast-iron plates backed with concrete, terminating in a cast-iron valve-tower, erected from the design and under the superintendence of Mr. A. R. Binnie, M. Inst. C.E. The embankment was cut down, the original culvert taken out, and the embankment was then made up solid in thin layers, the new tunnel being used to run water off during the reconstruction of the work. No leakage of any description had since been noticed, the valve-tower and tunnel being water-tight.

The Leeming compensation reservoir for millowners had been originally made with a circular culvert having a slip joint and iron shield where it crossed the puddle trench. This culvert was seriously fractured by the subsidence of the bank, which was mostly on a clay foundation, and it was considered unsafe to fill the reservoir. On the suggestion of Mr. R. Rawlinson, C.B., M. Inst. C.E., and of Mr. Binnie, on the latter taking charge of the Bradford Corporation Water-Works, the old culvert was abandoned, and a new tunnel was substituted, similar to the one at Stubden. The original culvert was afterwards filled on the inside with con-

crete, and the reservoir was successfully filled with water, no leakage or disturbance having occurred up to the present time.

In the case of the Leeshaw reservoir, which was in course of construction on Mr. Rawlinson's inspection, it was resolved to abandon the culvert already cracked, and to substitute a tunnel outlet and valve-tower of cast iron, similar to those at Leeming and Stubden. This had been successfully done, the reservoir filled, and the work had since proved most satisfactory. In two of the above cases the culverts were so damaged as to be a strong argument in favour of tunnel outlets distinct from the embankment.

The remainder of the paper explained the form and construction of the type of cast-iron tunnel outlet and valve-tower used in these works. The tunnels were mostly driven through Yorkshire grit and shale; they were 8 ft. 6 in. high, 7 ft. wide, and each tunnel had a fall of 1 foot in its length. The tunnel commenced at the bottom of a shaft, 13 or 14 feet deep inside the reservoirs, in which the lower part of the valve-tower, cased with concrete, was afterwards built. The valve-tower was composed of cast-iron rings with socket joints, caulked with iron borings and sal ammoniac. On the top of the valve-tower, at the level of the top of the embankment, a house was built to protect the valves, and the tower was connected with the mainland by a light wrought-iron Warren girder bridge on stone piers. The tunnel starting from the bottom of the valve-tower was elliptical in form, made in rings, each ring being composed of four segments bolted together and surrounded by concrete. It extended in a V-shape under one end of the embankment, and was a distinct work. At the angle of the tunnel, an air shaft was sunk, which was subsequently lined with cast-iron rings, and formed a ventilating-pipe. The supply-pipes, 2 feet in diameter, extended through the tunnel, and were jointed at the tower to a vertical stand-pipe, at equal intervals on which branches were cast and sluice-valves fixed. Connections to the pipes extended from the sluice-valves through the sides of the tower, and were further protected on the outside by flap-valves. Provision was also made for equalizing the pressure on the flap-valves, and for the expulsion of air when opening one of the flap-valves. A wrought-iron ladder extended up the tower, and at intervals there were grated floors so as to afford access to the valves and working parts. The connection of the bottom of the tower with the tunnel was made with a cast-iron gland, to the face of which a wrought-iron bulkhead was screwed, so as to make the valve-tower water-tight. The upper half of the bulkhead could be removed for entrance to that portion of the tunnel. These valve-towers had proved successful whenever erected. Mr. Binnie was the Engineer for carrying out the works, the Author being the Resident Engineer.

WATER GAS: ITS HISTORY AND MANUFACTURE.

By Professor Henry Morton, Ph.D.

[From the New York *Plumber and Sanitary Engineer*.]

No. III.

Turning now to the asserted use of carbonic oxide as an anæsthetic, the exact value of what has been reported on this subject can only be fully realized by a reference to the actual words of the experimenters who have worked in this field. The authorities or investigators in this subject are two in number—Dr. Ozanam, who published an article of about 20 pages in the *Archives Générales de Médecine*, Paris, 1857; and Mons. G. Tourdes, whose investigations are published in the *Comptes Rendus* of the French Academy for 1857.

Dr. Ozanam has been cited in various places as having made five experiments with carbonic oxide as an anæsthetic upon human beings, and, indeed, his language would in one place almost countenance such an opinion, for he says: "Our experiments and observations amount to 30 in all, of which 25 were made upon rabbits and five on men; among the latter there are two pertaining to Samuel Witte." This sounds well enough, but when we find these two "experiments or observations," "pertaining to Samuel Witte," are quoted from Orfila's "Toxicology," published 15 years before the date of Dr. Ozanam's paper, and that this same Dr. Ozanam farther on, under the heading of "Action of Carbonic Oxide on Man," says *not one word* about any experiment on man except these two of Samuel Witte, which he there quotes in full from Orfila—who, by the way, had himself quoted them—I am hardly encouraged to accept Dr. Ozanam as an authority on the use of carbonic oxide as an anæsthetic on man, since his own paper seems most distinctly to prove that *he had never ventured to try it*.

Why he did not so venture it will not be difficult to surmise after reading a few passages from his paper. Thus he says at the outset: "The phenomena produced by the inhalation of carbonic oxide naturally divide themselves into four periods—1. Premonitory stage. 2. Period of excitement. 3. Period of anæsthesia. 4. Death or recovery." This fourth stage might be embarrassing with a human subject. In fact, this author speaks of it in the following words:—"B. Death. The passing from stupor or apparent death to real death is sudden and unexpected, resembling in this respect sudden death by chloroform. The heart and respiration, already much enfeebled, are suddenly and for ever arrested. In one case, death ensued after two minutes of inhalation of the gas; but, a thing worthy of remark, in the course of our experiments, a rabbit submitted to chloroform died in a shorter space of time (1½ minutes)."

I cannot, without occupying too much space, give extracts which will do full justice to the whole tone and character of this paper; but I am quite sure that any one by reading it would be cured of any desire to complete the labours apparently undertaken by Dr. Ozanam, by making experiments with carbonic oxide as an anæsthetic on human beings.

Turning next to the only other investigator who seems to have cultivated this promising field—the application of carbonic oxide as an anæsthetic—we encounter in M. Tourdes article, near the beginning, a most encouraging phrase for the author, from whose other publication (pamphlet on the "Strasbourg Poisonings with Water Gas"), and his experiments quoted by Woodman and Tidy, we should hardly expect such an opinion, says: "The two fundamental facts are harmlessness of the gas and its anæsthetic action." That this is, however, only a careless form of expression very soon appears, for a few paragraphs farther he goes on: "When we prolong the action of the gas, the animal succumbs. It is necessary to arrest it as soon as the anæsthesia is complete. Death may be sudden, with cries and convulsions, but more frequently it is peaceful. The transition from sleep to death is insensible, respiration is arrested, the carbonic oxide seems to act by paralyzing the muscles of respiration. . . . In establishing the anæsthetic action of carbonic oxide, it is a duty to point out at the same time the dangers which result from the gaseous form and difficulty of application of this agent, so as not to take the responsibility of the accidents which will occur one of these days." This seems an unkind way of referring to a "harmless anæsthetic," whose only "difficulty of application" seems to be the trifling one that during its administration "the transition from sleep to death" may be "sudden" or may be "insensible," but is too probable to make the author willing "to take the responsibility of the accidents which will occur" if it is used.

It hardly seems to me, therefore, that the actual statements of those who have investigated the properties of "carbonic oxide as an anæsthetic" are calculated to reverse the unfavourable impression as to its qualities, which I must confess to have acquired from the general literature of the subject. It has, however, been asserted that, even granting that carbonic oxide is poisonous, so also is ordinary coal gas. To this it may be proper to suggest that, according to universal statement of such standard authors as have written on the subject, *the only practically poisonous constituent of coal gas is its 5 to 7 per cent. of carbonic oxide*. An increase in the amount of this poisonous constituent cannot be otherwise than *objectionable* in a material which is to be so widely distributed and introduced into such intimate domestic relations as illuminating gas.

Granting all this, however, it may still be asked, "What effect is the poisonous nature of this gas, even if *exceptional*, likely to have upon its introduction and use?" Let experience teach. We have the mild and harmless safety match, and we have the furious fulminating and incendiary parlour match. Has the poisoner of little children and the lighter of conflagrations been driven from our hearths and hearts, or rather vest-pockets, by his gentle and harmless rival? If water gas proves itself to be desirable for convenience or economy in the long run, it will be used, though the future welfare of the human race were to be imperilled by its introduction. At most, it is a remote and occasional risk. When the gas is burned, the carbonic oxide burns to the relatively harmless carbonic acid, and it is only in case of considerable leakage that any poisonous effect is to be feared.

So this question, like so many others, in its practical relations, comes down to the prosaic level of dollars and cents. Will water gas, as Wagner says (*not* Wagner of the "future music"), be "the gas of the future"? In matters of chemistry, and most of all in industrial chemistry, who can predict? We know that, in Europe, water gas has been thoroughly tried on the large scale, in a multitude of cases, with the most sanguine anticipations, during the last 20 years, and is everywhere a failure to-day. In this country, with our supply of cheap petroleum, it is under more favourable conditions, but here also we have a long history of failures. Success is claimed *at the present time* in several quarters. Will these claims in all or any cases be substantiated? Of this, at least, we may rest assured. The capabilities of the process are now (notably in the Municipal works) being put to the test in a thorough manner; and if it is within the reach of the best intelligence and engineering skill, success will be reached.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Although a moderately steady business is being done in the coal trade of this district generally, there is no pressure of orders in the market, and colliery proprietors find it difficult to maintain the advanced prices which most of them were asking at the commencement of the month, as in some cases the upward movement has been little more than nominal. The leading firms, however, are, as rule, firm, and the advance in prices which, so far, has only been partial, is likely to become more general at the close of the month. For house-fire classes of fuel the demand at present is rather dull, and many of the collieries have not yet got into full work. In other classes of fuel there is no very material change to notice. Iron-works are taking rather more of the common classes of round coal for forge purposes, and for steam coal there is an improving demand; but the total quantity going into consumption is not large, and the prices obtained, although not so low as those which some sellers were willing to accept a month or so back, are anything but remunerative. Burgy generally continues a drug, and, although slack is in better demand, in consequence of the improvement in the chemical and salt trades, there are larger quantities coming into the market, and there are sellers of inferior descriptions at lower prices. The average quotations at the pit mouth are about as under:—Best Wigan Arley mines, 9s. to 9s. 6d., with inferior sorts ranging from 6s. 6d. to 7s. 6d. per ton, according to quality; Pemberton four-feet, 6s. to 7s.; common Wigan mines, 5s. 3d. to 5s. 9d.; burgy, 3s. 9d. to 4s. 3d.; good slack, 2s. 9d. to 3s. 3d.; and common ditto about 2s. per ton.

A moderate quantity of coal is still going away for shipment; but, to secure orders, sellers, as a rule, have to take late rates, any advance in prices tending at once to check business.

In the iron trade there is only a moderate inquiry for the raw material, but manufactured iron continues in good demand; and, as forge proprietors generally are full of orders for the next two or three months, prices are very stiff. For delivery into the Manchester district, Lancashire pig iron is quoted at 53s. per ton, less 2½, for both foundry and forge numbers, and Lancashire bars at about £7 per ton.

Pipe-founders are tolerably busy, but the foundry trade generally is not brisk; and amongst engineers and machinists it is only in exceptional cases where there is any real activity.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

There has been a pretty good supply of tonnage for the gas trade of the Tyne, Wear, and Hartlepool. At the same time the weather was very stormy in the latter part of the week. The only port from which there were many shipments was the Tyne. The shipments of gas coals were an average; but from the cause mentioned, the state of the weather, there was a considerable detention of boats.

The Irish gas companies have been able to command a larger supply of tonnage. The rate paid was 8s. per ton steamers for a series of voyages to Dublin. The great strike of Durham miners in the latter part of the spring of this year is a circumstance not easily to be forgotten by the managers of gas-works. However, not only in Northumberland but in Durham an arrangement has been made, which, so long as it stands, will, it is believed, prevent a recurrence of such an untoward event as a great strike. The coalowners and pitmen in both counties have agreed upon a sliding scale, by which the contracting parties have bound themselves to abide twelve months at least, through which the rates of wages will rise or fall according to the price of coals, which will be taken at an average every three months. There is, therefore, now no danger that after colliery offices have made contracts with gas companies the men will spring upon them and demand more wages.

The general state of the coal trade is very little changed. The actual business to be done for gas coals in the open market cannot be very much. Most of the gas pits—indeed, all of any moment—are about fully contracted; they will be kept busy sending coals away, when the weather permits, down to this side of Christmas. Most of the leading collieries cannot at present offer a turn sooner than the middle of December. The steam coal trade is dull, as is usual at this season. The local demand for small coal improves; but as there is a pretty good supply in the market, prices cannot be forced up more than 3d., or, at most, 6d. per ton above quotations which have been current recently.

The iron trade of the Cleveland district, which comprehends North Yorkshire and the county of Durham, is recovering very steadily from its long depression. The shipments of crude iron to the United States and the Continent, and the exportation of railway plant to India, go on. There is a great demand for plates for building new iron shipping; so much so, that there has been a difficulty experienced in some instances in

keeping the dockyards provided with classes of iron to go on with. At the present time about one hundred new steam vessels are being built on the north-eastern coast and upon the Clyde, which will show the improvement that has taken place in this one branch of industry alone.

The chemical trade was not quite so buoyant last week. The advance in prices which had occurred over the previous two weeks was upheld. The consumptive demand, however, was not great. The shipping business to the Baltic was nearly closed for the year. The fire-brick, cement, and some trades depending upon shipping arrivals were not so active as they were a couple of months ago. At the same time, the prospects for next year of the chemical, the fire-clay, the iron, and the coal trades are most satisfactory.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

On Saturday, the 15th inst., a meeting of the intending Shareholders of the proposed new Gas Company for Buckhaven, Fifeshire, was held under the chairmanship of Mr. James Ireland. The minutes of the former meetings were read by Mr. Stewart, Clerk of the Committee, and also a letter from the Chairman of the Wemyss and Buckhaven Gas Company, in which an offer was made to concede so far to the request formerly refused by the Directors of that Company. Proceeding on the ground that the people of Buckhaven should have gas-works of their own, Mr. William Ireland moved that the gentlemen present form themselves into a Gas Company, to be called the Buckhaven Gaslight Company, and the motion was seconded by Mr. Mungo Baird. An amendment was proposed, asking for delay, and that negotiations should again be opened with the Directors of the Wemyss and Buckhaven Gas Company; but it did not find a seconder, the meeting being very hearty for the motion. A large Committee was appointed to carry out the arrangements. The subscriptions towards the proposed scheme already amount to about £1000.

At the monthly meeting of the Forfar Gas Commission, held on Monday, the 17th inst., notice was given of a motion to instruct the Gas Committee immediately to consider the question of supplying additional gas storeage at the works, with power to take what official advice they may consider necessary, and, if advised, to obtain an estimate of the expense, and to bring the same, together with a report, before a special meeting called for the purpose of hearing and conferring on the same.

After a prolonged agitation the people of Jamestown and Bonhill (Vale of Leven) are able to rejoice in having a large number of street-lamps erected and lighted, which give a very cheerful appearance to the public thoroughfares. The lamps are of the most modern construction.

Gas affairs seem to be very materially improved at Dumfries, if I may judge by some remarks made at the last meeting of the Municipal Authorities of that town. Mr. Lennox, the Convener of the Gas Committee, was elected Burgh Treasurer at that meeting, and in acknowledging his appointment said he should be glad to remain in office for two or three years more, in order to realize the complete success of the gas-works, which were now, he was glad to say, prospering to his entire satisfaction. Mr. Malam was doing his duty faithfully as Manager, and each successive week saw the undertaking in better condition. The Gas Committee were efficient in their work and unanimous in their action.

It is understood that there is some intention of getting the Glasgow Corporation Gas Committee to give active countenance and co-operation in furthering the movement for holding a Gas Apparatus Exhibition in the city. Considering the successful example already set by the town of Greenock, together with the effort now being made in the town of Paisley to have an exhibition of a similar character, it is earnestly hoped that the Gas Committee in its reconstituted state will not fail to do what is expected of it. To many people the wonder is that the idea of holding such an exhibition in Glasgow has not been worked out to some practical purpose long ago. But "better late than never."

The death has just been announced of Mr. William Taylor, who was for a number of years the active Manager of the Water Meter Company and the Glenfield Foundry Company, Kilmarnock.

The water supply works for Newport, at the Fifeshire end of the Tay Bridge, are now almost completed, and the total cost is likely to be much less than was originally anticipated. The inhabitants of Newport feel that they are in no small degree indebted to ex-Provost Robertson for the satisfactory arrangements made with the Water Commissioners of Dundee, and for the successful manner in which the whole works have been carried out. A Committee of the Local Authority has been authorized to take all the necessary steps for the imposing of the assessment and management of the works for one year.

At a meeting of the Wick Town Council held last Wednesday, a letter was read from the Board of Supervision requiring the Council as Local Authority to provide the burgh with a water supply, and to report to the Board within one month. Enclosed was a copy of a letter from Sheriff Thomas to the Board, making strong allegations on the unsanitary condition of the town, and stating that the Sheriff-Clerk and the Procurator-Fiscal were suffering in their health through defective drainage in the neighbourhood of the court-house. A Committee of the Council was appointed to report on the whole subject.

A fully attended meeting of the Annan Police Commissioners was held last Tuesday, for the further consideration of the water question. Provost Nicholson occupied the chair. Ex-Provost Batty, believing that the time had come to arrive at a decision on the matter, as they had sufficient data now before them, moved a resolution in favour of the Commissioners adopting one of the gravitation schemes prepared by Mr. Gale, C.E., Glasgow. Bailie Dunbar seconded the motion. Bailie Dobbie also thought a decision should be come to, more especially considering the threatening attitude of the Board of Supervision. He did not think a gravitation scheme would be cheapest, and moved in favour of adopting the scheme for pumping water from the river near the town, devised by Messrs. Leslie, C.E., Edinburgh. Mr. Ker seconded. After some discussion, a division was taken, and ten supported gravitation and five pumping. It was resolved to instruct Mr. Gale to draw out plans, &c., in connection with the Middlebie Burn scheme—the scheme favoured by the Commissioners. The Provost gave notice of motion for having the town surveyed for drainage, and for giving notice of a loan to the Public Works Loan Commissioners.

Last week's Glasgow pig iron market was very steady, and the fluctuations in price were within a very narrow compass. A degree of firmness prevails, which is surprising when the freedom with which the makers sell iron is considered. Many holders are convinced that a good spring trade may be depended on, and that fact imparts much of the strength which is evident. There is a steady improvement in the home trade, which strengthens daily, and does much to foster such hopes. Prices on Friday ranged from 56s. 8d. to 56s. 6d. one month, and from 56s. 4½d. to 56s. 1½d. cash.

Barmouth District Gaslight and Coke Company.—This Company, which was registered on the 18th inst., with a capital of £7000 in £5 shares, proposes to acquire and carry on the Barmouth Gas-Works, Barmouth, in the county of Merioneth.

Sale of Shares in the British Gaslight Company at Norwich.—On Tuesday last Messrs. Spelman offered for sale 20 shares in the British Gaslight Company. Five of the shares sold for £96, and the remainder were withdrawn.

Thurso New Gas Company, Limited.—This Company was registered on the 15th inst., with a capital of £15,000 in £10 shares, to take over the property and business of the Thurso Gaslight Company, Thurso, in the county of Caithness.

Sale of Shares in the Bakewell Gas Company.—On Monday last week, Messrs. Bingham and Son offered for sale twelve £5 fully paid-up shares in the aboved-named Company. The shares were sold in two lots—the first realizing £60 18s., or at the rate of £10 3s. per share; the second, £61 10s., or at the rate of £10 5s. per share.

Newhaven Gas and Coke Company, Limited.—This is the title of incorporation, as a limited company, of a Company originally, constituted by deed of settlement, dated the 1st day of August, 1855. The nominal capital is £5000, in £10 shares, of which 350 have been allotted, and the full amount paid upon each. It was registered on the 13th inst., in accordance with a resolution passed at a special meeting of members.

General Electric Society, Limited.—A Company with the above title was registered on the 12th inst., with a capital of £1,000,000 in £10 shares. The Company propose to acquire and work the British, foreign, and colonial patents of Paul Jablochkoff and others, relating to electric and other lights, or to the use or application of electricity, magnetism, or other similar agencies. Power is taken to enter into contracts for lighting districts, towns, cities, buildings, and establishments.

The Accident at the Phœnix Gas-Works.—On Tuesday afternoon Mr. Watson Lawton, a resident of Gorton, near Manchester, who was crushed beneath an iron girder at the Phœnix Gas-Works, Vauxhall, as reported in last week's paper, expired at St. Thomas's Hospital. The deceased, who was in the employ of Messrs. Clayton, Son, and Co., of Hunslet, had only just arrived from Manchester, in order to superintend the fitting of several large iron girders at the works.

Carnarvon Corporation Gas Supply.—The monthly meeting of the Carnarvon Town Council was held last Tuesday, when the Gas Committee presented their report for the quarter ended Sept. 30. It showed there had been a decrease in consumption of 9·32 per cent., as compared with the corresponding quarter last year; an increase of 14 per cent. over 1877; and of 47·57 per cent. over 1876. The leakage account had been reduced since last year from 21·21 to 10·65 per cent. The Chairman of the Committee (Alderman De Winton) said that the works were in an excellent state, and would last without further alteration for 10, or possibly 20 years. Through the erection of the new purifier, the illuminating power of the gas had been increased to 16·8 candles.

Boring for Water at East Dereham.—The work of boring for water undertaken by the East Dereham Local Board was commenced on Monday, the 10th inst. The site of the works is about 216 feet above Ordnance datum, the centre of the town of Dereham being 178 feet. Two days work showed that a depth of 21 feet had been bored, including the following strata:—Surface soil, 2 ft.; sand and gravel, 5 ft. 6 in.; brick earth, 4 ft.; strong clay, 6 ft. 6 in.; sand and gravel, 1 ft.; boulder clay with very small chalks, 2 ft. Up to the present time a 12-inch diameter bore has been used, and a bore of 10 inches will be used to a depth of 80 feet; after which a bore of 8 inches diameter will be employed until water is met with. The boring will be lined with tubes when necessary. It is expected that the chalk will be found at a depth less than 150 feet; and boring will be continued till water is found. Some uncertainty exists as to the exact depth of the chalk in the locality, as no trial boring has been made in this particular neighbourhood. At Swanton Morley, however, the chalk crops out, and at Swaffham the water-works well has been carried into the chalk at a depth of about 80 feet, so that those who are carrying out the work are hopeful in regard to the matter.

Register of Patents.

1711.—Evans, J., Wolverhampton, "*Improvements in steam-pumps and other motive-power engines and pumps, applicable also to valves and other purposes.*" Patent dated April 29, 1878.

According to these improvements the steam piston of the pumping-engine is constructed in two parts forming the ends thereof (either formed in one piece or fixed together), the ends being distanced apart from each other at somewhat more than the length of the stroke. The hollow space thus formed between the two ends of the piston is the steam chest, and contains a slide-valve working over points in the inner face of the cylinder. The slide-valve has three bars and two openings in its face, and works over two ordinary steam ports passing one to each end of the cylinder, one central exhaust port, and two ports recessed into the inner face of the cylinder. The recessed ports allow the steam to flow from the steam chest alternately under each end bar of the valve, and into the corresponding steam port to the end of the cylinder. The valve is actuated by being moved alternately by the inner ends of the hollow piston; or else, and preferably, the steam valve is constructed as a small steam cylinder, the piston of which is fixed so that the cylinder only moves. The small cylinder is provided with a valve actuated by the main piston as it approaches each end of the stroke.

The pump piston and valve are constructed similarly as the steam piston and valve, except that the valve is a three-port slide, as it works over one centre (suction) port and two end ports, passing one to each end of the pump cylinder. The fluid under pressure is forced into the hollow space between the ends of the piston, and passes from thence to the air vessel or into the delivery-pipes. The pump valve is provided with two pistons working on cylindrical parts, one at each end of the valve. These pistons are upon the same rod or axis (and parallel with the axis of the pump cylinder), so that as one piston is pushed inwards the other moves outwards.

1726.—Pettersson, A. K., Swansea, "*Improvements in automatic feed regulators for carburetters.*" A communication. Provisional protection only obtained. Dated April 30, 1878.

The object of these improvements is to render the carburetting of either air or gas uniform, by making the automatic regulation of the flow of the liquid hydrocarbon dependent directly upon the flow of the gas, and to utilize all the hydrocarbon employed. To this end the invention consists in connecting the valve of any of the ordinary forms of automatic gas-governors directly with the valve or cock controlling the supply of hydrocarbon, so as to cause them to act in constant unison together, whereby the sensitiveness of both valves is always the same, and the respective flows of the gas and hydrocarbon always maintain a constant and uniform relation to each other, independently of the carburetting apparatus, the proportion of hydrocarbon being constantly just that which the amount of gas can take up.

The invention also consists in apparatus for the adjustment of the

devices to the varying temperature of the season and the pressure of gas in the mains; and also, further, in the adaptation of the valve of the governor to the valve or cock of the hydrocarbon circuit.

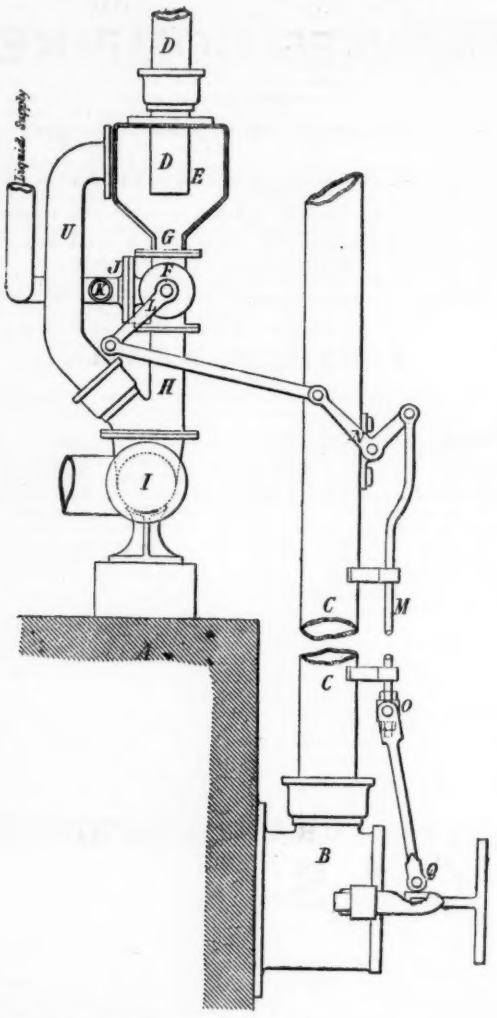
1754.—Michel, C., and Frager, A., Paris, "*Improvements in water-meters.*" Patent dated May, 1, 1878.

The meter which forms the object of this invention belongs to the class of cylinder meters combined with a registering apparatus, and relates particularly to the arrangement of the motor or the measuring apparatus, and to the control of the register.

The water-pressure motor is composed of two cylinders in juxtaposition, each containing a piston. Each cylinder is provided with a slide-valve, which at the proper time displaces the piston in the other cylinder. The cylinders are for this purpose prolonged at the back part to receive an arrangement of levers, which are put into action by the pistons at the end of their travel or stroke. There are no tubes for putting the slide-valve orifices into communication with the cylinders, these orifices opening directly into the measuring compartments. The levers displacing the slide-valves turn freely on their pivots without stuffing-boxes; they act in one of the chambers of the box. The meter's action may be easily stopped for discovering leakages by reason of the arrangement of the mechanism which puts the piston of one cylinder in connection with the slide-valve of the other cylinder.

1764.—Cutler, S., Millwall, London, "*Improvements in apparatus used in the manufacture of gas.*" Patent dated May 2, 1878.

This invention has for its object the construction of apparatus whereby the pressure on the retort during the manufacture of gas may be removed, and it consists in interposing and fixing between the top of the ascension-pipe (which is curved or otherwise suitably formed) and the pipe leading to the conducting main, a chamber or vessel divided by a partition into two compartments. This partition extends from the top to about two-thirds the depth of the chamber. At the bottom of the chamber is fixed a three-way valve, one way being always open to the chamber already mentioned, one way leading to a connection with the conducting main, and the other way leading (by means of a connection) to a water-pipe arranged parallel to the range of retort-benches and the conducting main. This water-pipe has attached to it a supply-pipe, which is in communication with a cistern, and is so arranged that the level of the liquid within it shall be constant, and of a height somewhat above the bottom of the partition in the chamber. The three-way valve is operated upon by a lever, to which a rod or chain is attached, and this rod or chain in its turn is attached to the cross-bar, screw, or lid of the retort in such a way that the opening or closing of the lid or fastening actuates the valve in the necessary direction. Instead of a three-way valve two separate cocks may be used, both being connected to the same lever or arm.



The above illustration is a side elevation of one form of the apparatus, a part of it being also in section. A is the retort-stack; B, the retort mouthpiece; C, the ascension-pipe; and D, the dip-pipe or circular partition dividing the chamber, E, into two parts. F is the three-way valve, with its connection, G, to the chamber, E; its connection, H, to the conducting main, I; and the other connection, J, is fitted to the water-pipe, K. The valve, F, has a lever, L, that is operated upon by the rod, M, through the intervening lever, N. The lower part of the rod, M, is jointed, as at O, and its attachment to the cross-bar is formed by a swivel joint at Q, the end of the rod that passes through the bar being free to turn horizontally. By these means the closing of the retort-lid pushes the rod up and opens the valve so as to allow of the escape of liquid from the chamber, E, and the gas to the conducting main, while the opening of the retort-lid draws down the lever and opens the valve so as to permit water or other liquid to flow into the chamber, E, seal the dip-pipe, and thus close the passage for gas.

The action of the apparatus is as follows:—The cistern being furnished with water or other liquid, the valve is adjusted so as to permit the flow of liquid passing into the chamber, E, and rising to a little above the bottom of the partition, D, and level with the gas conduit, U, leading to the conducting main. (The gas conduit can be dispensed with if thought desirable, and is introduced more especially on the ground of safety.) When the retort is charged, the closing of the lid or fastening will move the lever, L, close the communication between the water supply and the chamber, and open a communication between the chamber and the conducting main, down which the liquid contained in the chamber will be immediately discharged into the conducting main, or a separate main provided for the purpose, leaving the passage between the ascension-pipe and the gas conduit free for the gas to pass to the conducting main. On the re-opening of the retort-lid, the lever will be moved in the opposite direction, and the way opened for the introduction of water or other liquid to the chamber, to a height sufficient to re-seal the partition, D, and thus cut off the communication with the conducting main. The passage down which the tar and other liquid products pass will also serve as a passage for the gas.

1770.—Abel, C. D., Southampton Buildings, London, "*Improvements in apparatus for igniting the charges of gas moter engines.*" A communication. Provisional protection only obtained. Dated May 2, 1878.

This invention has reference to the use of the electric spark for igniting the charges of gas motor engines, and consists in the use for this purpose of the spark produced by the interruption of a current generated in the closed circuit of the coil of an armature revolving or oscillating between the poles of one or more magnets.

1798.—Hallewell, R., Blackburn, "*Improvements in gas-engines, applicable in part to other uses.*" Patent dated May 4, 1878.

This invention relates, in the first place, to the class of gas-engines having two pistons fitted in one cylinder, one piston being driven outwards by the explosion, and being held during the acting stroke of the other piston, and it is to means for holding the first-named piston that the first part of the invention principally relates. In one arrangement, two blocks or gripping pieces are mounted upon a lever in such a manner as that when the lever is moved in one direction the blocks are tightened upon the piston-rod, and when moved in the other direction the piston-rod is released. In a second arrangement, the piston-rod slides between a fixed face or bearing surface and the face of a wedge gripping piece, or between two wedge-gripping pieces.

In the second place, the invention relates to the supply of gas, and has for its object to obtain a more perfect mixture of the gas and air.

According to a third part of the invention, the cylinder of the engine is provided with an air inlet-valve, which admits air during a part of the stroke of the engine, a mixture of air and gas being subsequently admitted.

In the fourth place, in double-piston gas-engines a cylindrical block or shell is fitted to slide in an extension of the cylinder, and connected with the working piston.

In the fifth place, in double-piston gas-engines, the exhaust port is made of a T-shape.

A sixth part of the invention relates to the slide-valves of gas-engines.

According to the remaining part of the invention a hinged arm is employed to carry a screw to press the valve cover against the slide-valve of the engine.

1844.—Ashworth, G. K., Halifax, "*Improvements in valves or taps used for steam, water, gas, or other liquid or fluid, such valve or tap being specially applicable for tallow cups for lubricating purposes.*" Patent dated May 8, 1878.

These improvements consist in constructing valves or taps on the principle of a slide-valve, such as is used for admitting steam into the cylinder of a steam-engine. The sliding part of the valve is made to reciprocate by means of an eccentric or cam, instead of the usual slide-rod and its stuffing-box. When used as a tallow cup the ports or openings of the valve are made to communicate with an opening in the bottom of the cup, and also with the part required to be lubricated, and the length of the stroke given to the slide is regulated by the throw of the eccentric or cam. A ratchet-wheel and catch are fixed on the end of the eccentric spindle, and motion is given thereto from any moving part of the engine or machine to which it is applied.

APPLICATIONS FOR LETTERS PATENT.

4697.—Robinson, A. H., Dublin, "Improvements in meters or apparatus for measuring or ascertaining the flow of water or other fluids, which improvements are also applicable to motive-power engines for screw-driving, mortising, drilling, slotting, and other purposes." Nov. 18, 1879.

4702.—Wirth, F., Frankfort-on-the-Main, Germany, "Improvements in automatic gas-burners." A communication. Nov. 19, 1879.

4704.—Livesey, G. T., Old Kent Road, London, "Improvements in apparatus used in the manufacture of gas." Nov. 19, 1879.

4712.—Franks, M., Blenavon, South Wales, "An improved reflector or distributor of light for lamps or other similar lighting apparatus." Nov. 19, 1879.

4720.—Thorp, T., Whitefield, and Tasker, R., Prestwich, Lancs, "Improvements in gas regulators." Nov. 20, 1879.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2007.—Sugg, W. T., Westminster, "An improved mode of and apparatus for supplying air to gas-burners and carrying off the products of combustion." May 20, 1879.

2025.—Penn, T., Wandsworth Road, and Ullathorne, G. S., Wandsworth Common, London, "Improvements in valves or cocks, and in apparatus for opening and closing valves or cocks, which improvements are particularly applicable to the prevention of waste of water." May 21, 1879.

2073.—Foulis, W., Glasgow, "Improvements in that class of motive-power engines known as gas or hydrocarbon engines." May 24, 1879.

2109.—Abel, C. D., Southampton Buildings, London, "Improvements in wet gas-meters." A communication. May 27, 1879.

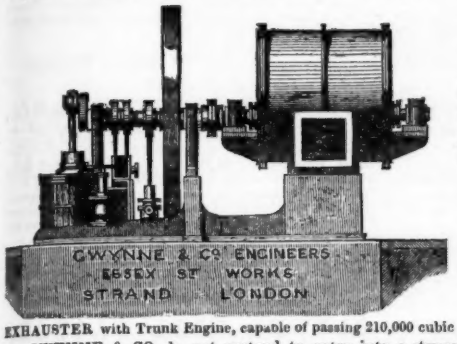
2111.—Lake, W. R., Southampton Buildings, London, "Improvements in electric lighting apparatus." A communication. May 27, 1879.

2137.—Bischof, G., Bloomsbury, London, "Improvements in the means and apparatus for effecting the purification or filtration of water, sewage, and other impure liquids." May 29, 1879.

3507.—Faulder, H., Stockport, Lancs, "Improvements in the application and apparatus for supplying gas to the roasting of coffee." Sept. 2, 1879.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

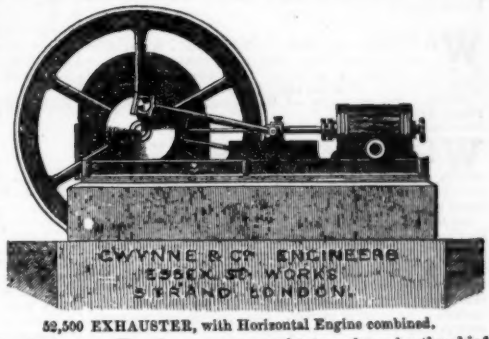
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

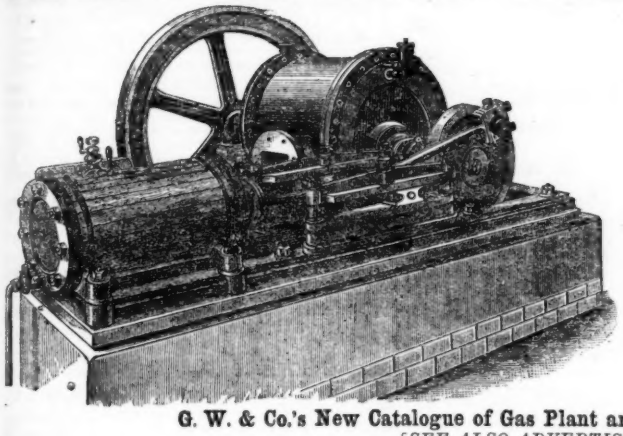
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.**, Hydraulic and Gas Engineers,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH

Wrought-Iron Spindles and

ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.

**MAKERS OF ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.**

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[*SEE ALSO ADVERTISEMENT, PAGE* 838.]

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

Now Ready, Price One Guinea,

PRECEDENTS IN PRIVATE BILL LEGISLATION

AFFECTING GAS AND WATER UNDERTAKINGS.

COMPILED BY MR. G. W. STEVENSON, C.E., F.G.S.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

Now Ready, Handsomely bound in Morocco gilt, cloth sides, gilt edges, Vols. 1 and 2 of

KING'S TREATISE

ON THE

SCIENCE & PRACTICE OF THE MANUFACTURE & DISTRIBUTION

OF

COAL GAS.

EDITED BY THOS. NEWBIGGING, C.E., M. INST. C.E., AND W. T. FEWTRELL, F.C.S.

VOL. I. contains 460 pages of Letterpress, and is illustrated by 521 Woodcuts and 36 page and double-page Engravings, printed on Plate paper, and a full-page COLOURED ENGRAVING of the BECKTON GAS-WORKS, forming a frontispiece to the Work.

VOL. II. contains 470 pages of Letterpress, and is illustrated by 355 Woodcuts and 28 page and double-page Engravings

Price of each Volume, 28s.

ORDERS RECEIVED BY

WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

WANTED, Readers of the NEW Edition, 1879, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, a Situation as Improver in Gas-Fitting, Bell-Hanging, and Lock-Smithing. Five years experience.
Address JOHN MEREDITH, North Street, Rhayader, RADNORSHIRE.

WANTED, by the Advertiser, a Situa- tion in Gas-Works. Six years practical experience at Works making 90 millions. Fair Draughtsman, and quick at figures. Can use photometer.
Address No. 608, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a respectable Married Man, a Situation as MANAGER in a small Gas-Works. Thoroughly understands the Making and Distribution of Gas, Gas-Fitting, Main and Service Laying. Good references.
Address ROBERT AINSLEY, 32, John Street, West Pelton, by Chester-le-Street, DURHAM.

WANTED, a Place as Assistant or otherwise, by a Practical Fitter, Draughtsman, Gas Manufacturer, and Book-keeper. French and Russian spoken. At home or abroad. High references; moderate salary. Aged 31.
Address No. 607, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS COMPANIES AND CORPORATIONS.

WANTED, by the Advertiser, a Situa- tion as SECRETARY and MANAGER of a small Gas-Works, or ASSISTANT MANAGER of a large Works. Has had every experience in a large Gas-Works. Advertiser's only reason for wishing to leave present situation is to better himself. Good references and testimonials.
Address No. 606, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO be Sold by Private Contract, Small Gas-Works PLANT—Meters and Machinery. Cost £3000 a few years since. Can be had for £1000. Situated in a village five miles from coal mines.
Address METER, Post Office, Whitchurch, SALOP.

TO BE SOLD, Cheap, Three Telescopic GASHOLDERS, two 60 ft. diameter and 20 ft. deep each lift, and one 70 ft. in diameter and 20 ft. deep. Only been in use eight years. May now be seen at work at the Effingham Street Gas-Works, Sheffield.
For price, apply to THOMAS PIGGOTT AND CO., Spring Hill, BIRMINGHAM.

BUCKPOOL GASLIGHT COMPANY.

FOR Sale, by Private Bargain, the whole PLANT belonging to the Company, including Gas-Works, Pipes, Meters, and Machinery. All in excellent working order.
Apply to JOHN MERSON BANK, Agent, or ALEXANDER MAIR, Solicitor, Buckie, the Liquidators of the Company.
Buckie, Nov. 11, 1879.

THE Directors of the Newmarket Gas Company are prepared to receive TENDERS for 25,000 Gallons of TAR at present in stock at their Works.
Tenders, stating price per gallon, delivered in Contractor's barrels, on rails at Newmarket Station, to be sent to the undersigned, on or before Saturday, the 29th inst.
By order,
THOMAS WILKINSON, Manager.

TO MANUFACTURERS OF FIRE-CLAY GOODS.

THE Directors of the Rochester, Chat- ham, and Strood Gaslight Company are prepared to receive TENDERS for the Supply of about 900 feet run of CLAY RETORTS, 20,000 BRICKS, 200 TILES, and 20 tons of CLAY, according to specification, which may be had on application at their Office, 56, High Street, Rochester, where tenders on the Company's form, and marked "Tender for Retorts, &c.," must be delivered before Noon of Thursday, Dec. 11, 1879.
By order,
W. SYMS, Secretary and Engineer.
Nov. 18, 1879.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—
110 Mouthpieces, D-shape, 13 in. by 22 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. 28 Mouthpieces, D-shape, 16 in. by 20 in., with Wrought-Iron Lids, Cross-Bars, Stand, Bridge, and Dip Pipes. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12 in. Slide-Valves and 12 in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12 in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Three 4-in. Pumps, with cranked Shafting and a pair Mitre Wheels.
Set of four Purifiers, 12 ft. by 12 ft. by 4 ft., with 12-in. Centre-Valve (Cockeys), and Connections and Lift complete.
Station-Meter by A. Wright and Co., London, with three 12-in. Slide-Valves, and 12-in. Bye-Pass and Connections, to pass about 25,000 feet per hour.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
Two 12-in. Governors, by Wright, London, with 12-in Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

STOCK OF THE BRISTOL UNITED GASLIGHT COMPANY.

MESSRS. H. R. FARGUS & CO. will Sell by Auction, in pursuance and under the provisions of the Bristol United Gaslight Company's Act, 1873, at their Sale Room, Clare Street, in the city of Bristol, on Friday, Dec. 19, 1879, at Two o'clock precisely, £15,000 CAPITAL STOCK, issued by them under the authority of the above-named Act.
The Stock will be sold in lots of £100 each.
For conditions of sale and any further particulars, apply to the Auctioneers, Clare Street, Bristol; to the Secretary of the Company, Canon's Marsh, Bristol; or to Messrs. BRITTAN, LIVETT, BOX, and Co., Solicitors, Albion Chambers, BRISTOL.

BOROUGH OF EAST RETFORD CORPORATION WATER-WORKS.

CONTRACT C.—TO IRONFOUNDERS.
WATER-PIPES WANTED.

THE Corporation of East Retford are desirous of receiving tenders for about 19,000 yards of Cast-Iron WATER-PIPES and BRANCHES and other pieces for the public water supply of their district.
Parties willing to tender may see the drawings and specification and conditions at the Office of the Town Clerk, East Retford, from Monday, Nov. 24, to Wednesday, Dec. 3, between the hours of Ten and Four each day.
Sealed tenders to be sent in to the Town Clerk not later than Tuesday, Dec. 16, at Ten o'clock a.m., endorsed "Tenders for Main-Pipes, &c."
The Corporation do not bind themselves to accept the lowest or any other tender, nor will they make any allowance for estimates.
Copies of specification, bills of quantities, and form of tender can be obtained by applying to
SAMUEL JONES, Town Clerk.
East Retford, November, 1879.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Plymouth and Stonehouse Gaslight and Coke Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works for One or Three years from Jan. 1st, 1880. A separate quotation should be named for each of the aforesaid periods.
The Company will deliver the Tar through their main into the Contractor's vessels at the Creek, Sutton Pool, or into his carts on their Works free.
Payments to be made in cash monthly. The Directors may require the Contractor to give security for the faithful performance of his contract.
Further particulars can be obtained on application to the Secretary, at the Company's Offices, 1, Athenæum Terrace, Plymouth, to whom sealed tenders, endorsed "Tender for Tar," are to be sent on or before Wednesday, Dec. 17, next.
The Directors do not bind themselves to accept the highest or any tender.
By order,
JOHN THOMAS, Secretary.
Gas Offices, 1, Athenæum Terrace,
Plymouth, Nov. 22, 1879.

GAS LIGHTING IMPROVEMENTS.

GEO. BRAY & CO.'S NEW PATENT LANTERNS.

See Page 834.

THE

IMPERIAL METER CO.,

LIMITED,

Makers of THE IMPROVED DRY GAS-METERS, THE PATENT WET GAS-METERS, Special Meters for Public Lighting, STATION-METERS, Governors, &c.

KING'S ROAD, ST. PANCRAS,

Formerly also (Walter Ford) at Gray's Inn Road.

TO MECHANICAL ENGINEERS, CONTRACTORS, AND OTHERS.

THE Directors of the Rochester, Chat- ham, and Strood Gaslight Company are prepared to receive TENDERS for the Erection of a Wrought-Iron ROOF, about 100 ft. by 60 ft., at their Works at Rochester, according to specification, which may be had on application at their Office, 56, High Street, Rochester; where also the plans may be seen.
Tenders, on the Company's form, and marked "Tender for Roof," must be delivered at the Office as above, before Noon of Thursday, Dec. 11, 1879.
By order,
W. SYMS, Secretary and Engineer.
Nov. 19, 1879.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER
AND
CANNEL COAL FACTOR,
30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Prices, half bound, cloth sides, 2 quires, 30s.; 3 quires, 36s.; other sizes and bindings to order.

THE

GAS COMPANIES EXPENDITURE JOURNAL,

Being a Ruled Account-Book with Printed Headings, and Analyzing Guide for Keeping, upon the easiest and most correct method, the Expenditure of a Gas Company, in accordance with the provisions of the Gas-Works Clauses Act of 1871, and suitable for all Companies.
Specimen, with illustration and full particulars; 2s. 6d. returned on the purchase of a "Journal."
Published by SANDELL AND SON, Accountants, 2, Great George Street, WESTMINSTER, and W. KING, Office of the JOURNAL OF GAS LIGHTING, 11, Bolt Court, FLEET STREET, E.C.

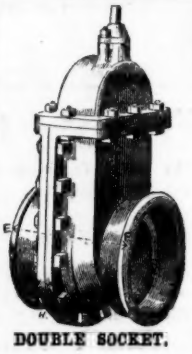
Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

Orders to be sent to

WALTER KING,
11, BOLT COURT, FLEET STREET, LONDON, E.C.



DOUBLE SOCKET.

IMPROVED SCREW-VALVES,

For Water, Tar, Ammoniacal Liquor, &c.

MADE EITHER WITH FLANGED OR SOCKET ENDS.

B. DONKIN & Co.

BERMONDSEY, LONDON, S.E.

J. & H. ROBUS,

BUILDERS AND CONTRACTORS

FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

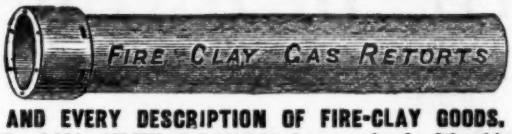
ESTIMATES GIVEN FOR MAIN-LAYING.

N.B.—All kinds of Fire Goods and Gas Apparatus supplied on the shortest notice.

Address:—J. & H. ROBUS, BELL GREEN, CATFORD, LONDON, S.E.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,



AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

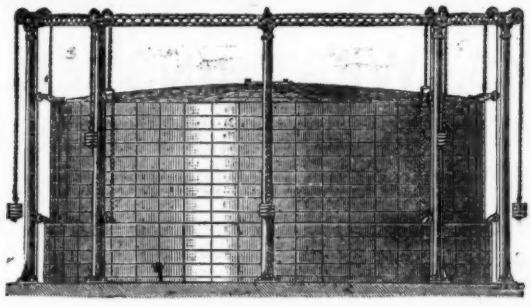
COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.



J. T. B. PORTER & CO.,

GAS ENGINEERS & MANUFACTURERS,

IRONFOUNDERS AND CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

GAS COAL.

THE Tawd Vale Colliery Company, Limited, are prepared to Contract for the Supply of their superior Arley and other GAS COALS, and to send samples to the order of Gas Engineers and others, or complete analysis on application. Shipped at Liverpool, Preston, Fleetwood, Garston, or Birkenhead.

Mr. James Paterson, C.E., F.G.S., in his analysis of T. V. Arley Coal, says: "Some parts merge into a semi-Cannel; Gas per ton, 10,300 cubic feet; illuminating power, 16·96 candles; coke of high quality, 1431 lbs. per ton."

Collieries, Skelmersdale, near Ormskirk; Offices, 5, New Hall, Old Hall Street, LIVERPOOL.

Less Heat, No Smoke, White Light, & Economy.

SPECKSTEIN & LAVA Gas-Burner Fabricants

On the most approved French and German principles.

These Burners can be made to consume from 1½ feet to 20 feet of gas per hour, and to give a light from 4 to 150 candle power.

Terms and Discount on application.

Catalogue, 6d. Sample Burner, 1s.

AUGUSTUS WESTWOOD & Co., COMMERCIAL CHAMBERS, WEST BROMWICH.

TO GAS COMPANIES.

GEORGE McKAIG,

MANUFACTURER OF

GAS-PURIFYING WOOD SIEVES,

153, CLEVELAND STREET,

DONCASTER.

It requires but one trial to prove the Superior Make, Strength, and Durability of these Sieves.

CARRIAGE PAID.

ASBESTOS,

INDESTRUCTIBLE FUEL FOR GAS-FIRES.

REDUCTION IN PRICES.

Apply for Price List and Samples to the Original Manufacturer,

THOS. REYNOLDS,

100, ASTON ROAD, BIRMINGHAM.

TROTTER, HAINES, & CORBETT,

BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

G. E. TOURNAY,

RETORT-SETTER,

CONTRACTOR FOR THE ERECTION OF

Chimney Shafts, Retort Ovens, &c.,

ST. MARY'S STREET, WINCHEAP, CANTERBURY.

First-Class Testimonials.

ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out* OF ACTION.

A Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms, and to treat, by Purchase or Exchange, for Spent Oxide.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

WILLIAM SUGG'S

PATENT LONDON ARGAND

AND

FLAT-FLAME BURNERS.

GAS COMPANIES and the TRADE are respectfully informed—

That WILLIAM SUGG has NOT disposed of any of his Patents to any Company or individual whatever.

That the **London Argand and Christiania Burner**, together with WILLIAM SUGG'S **New Improved Street-Lighting Burners**, are manufactured, as previously, at

VINCENT WORKS, WESTMINSTER.

In order, however, to combine the advantages of artistic construction in Chandeliers and Fittings with Gas-Burners constructed to develop the light to its fullest extent, WILLIAM SUGG begs to announce that a mutual arrangement has been completed between himself and the well-known firm of

R. W. WINFIELD & CO., CAMBRIDGE ST. WORKS, BIRMINGHAM,

which accords them the sole licence to manufacture such parts of his various Patents as shall enable the combination indicated above to be effectually carried out.

It is, therefore, confidently expected that by this arrangement Chandeliers and Gas-Fittings will be produced which, from their high-class design and workmanship, will be generally admired as ornaments, and also, by the conjunction with WILLIAM SUGG'S Burners, satisfactorily fulfil their office of lighting, establishing a perfect illumination in place of the semi-darkness which generally prevails in consequence of unscientifically-made Burners, which destroy instead of developing the illuminating power of the gas. It is further hoped, as these improved lights become adopted by the public, that the groundless assertion that "the gas is bad" will disappear.

VINCENT WORKS, VINCENT STREET, WESTMINSTER.

THE

"WARNER & COWAN" METER.

THIS Meter stands alone and unrivalled, as the only thoroughly reliable, and continuously accurate, measurer of gas.

The drum is properly described as "self-regulating," its construction being such that it maintains practical uniformity of discharge per revolution throughout all changes of water-line.

All other Wet Meters either vary with a varying water-line (because their drums are *not* self-regulating), or are complicated by "compensating" arrangements in the futile and *now wholly superfluous attempt* to make the water-line unvarying.

Loss of water by evaporation or otherwise, neglect to supply it at the proper time, or to the correct degree (so necessary for the registration of other Meters), produces no change in the measurement of the WARNER & COWAN. Even in the extreme case of a prolonged neglect to water leading to the extinction of the lights, nothing but inconvenience would arise; whereas with an ordinary Wet Meter this inconvenience would, in such a case, not only occur (and much sooner, because of the shorter range of float), but would be preceded by a considerable alteration of capacity, and therefore incorrect registration.

"Compensating" Meters, depending as they all do upon complex arrangements (extraneous to the drum), for maintaining the water-line, are not only inadequate to the duty, but unreliable in action.

The drum of a Meter being the measurer, ought to be *in itself* a true and unvarying measure. This, the WARNER & COWAN drum *alone* is.

W. & B. COWAN,

(ESTABLISHED 1827.)

WET & DRY GAS-METER MANUFACTURERS,

Sole Licensees and Manufacturers of

THE AUTOMATIC PRESSURE CHANGER,

[WM. COWAN'S PATENT.]

CHURCH ST., MILLBANK ST., *LONDON, S.W.* | DUTTON ST., NEW BRIDGE ST., *MANCHESTER.* | BUCCLEUCH ST. WORKS, *EDINBURGH.*

THE

SILBER LIGHT COMPANY,

MANUFACTURERS OF

SILBER'S PATENT TUBULATED BURNERS

FOR

COAL OR AIR GAS,

And of SILBER'S BAT'S-WING GAS-BURNERS and every variety of Gas-Fittings.

ALSO MANUFACTURERS OF

EVERY DESCRIPTION OF LAMPS (burning Colza Oil, Petroleum, Paraffin, or Kerosene) FOR DOMESTIC PURPOSES, STREETS, RAILWAY STATIONS, SHIPS, &c., &c.

FIG. 1.
Silber's Patent Tubulated Gas-Burner, drawn full size.

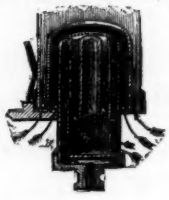


FIG. 2.
Section of Silber's Tubulated Gas-Burner, the arrows indicating the currents of air to the flame —two externally and two internally.
Dr. Wallace, F.R.S.E., Gas Analyst of Glasgow, says of this burner: "It gives the steadiest flame of any Argand yet constructed."

FIG. 3.
Silber's Tubulated Gas-Burner with glass bulb or vase beneath, and with larger inlet than aggregate outlet area, by which means the illuminating power for 5 cubic feet of 16-candle-light gas is increased one candle.

The Silber Tubulated Gas-Burner offers the following advantages over existing Argand Gas-Burners:—

1. It affords more light for 5 cubic feet of gas.
2. It is made of brass, and so put together that there is no liability of its melting, or coming to pieces in any other way, as burners made of soft metal are apt to do.
3. It is capable of burning from 4 to 7 cubic feet of gas per hour (by using chimneys of different lengths), and although the consumption be increased, **the illuminating power per cubic foot of gas remains almost quite constant.**
4. With the glass bulb or vase, as shown in fig. 3, the illuminating power for 5 cubic feet of 16-candle-light gas is **increased one candle.**

FIG. 4.
Silber's Bat's-Wing Gas-Burner.
The results obtained from this Burner are amongst the best obtained from any flat-flame Burners yet introduced.

FULL PARTICULARS & ENGRAVINGS

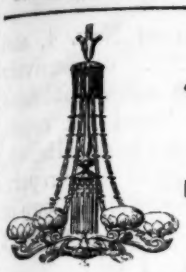
Forwarded on application to

THE SILBER LIGHT COMPANY,

49, WHITECROSS STREET,

LONDON, E.C.

FIG. 5.
Silber's Bat's-Wing Burner, with Opal Gas Moon.



F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

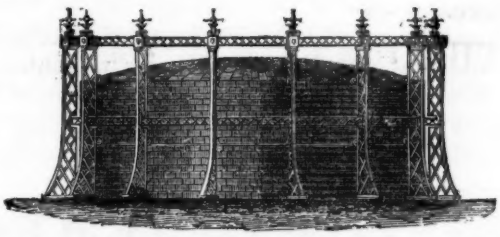
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

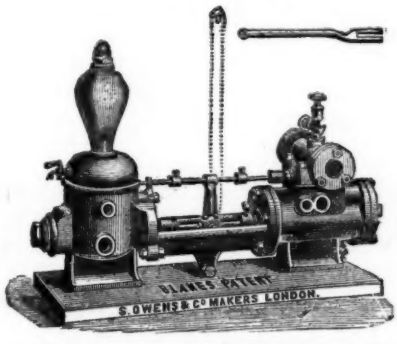
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS

IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense:

For particulars, price, &c., apply to Mr. E. Price, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

JAMES NEWTON & SONS,

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.,

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:

DARTMOUTH & BRIXHAM (TORBAY) DEVON.

OFFICES:

23, GREAT GEORGE STREET, WESTMINSTER LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF

WOLSTON'S CELEBRATED

TORBAY IRON PAINTS.

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Wagon Works, and the Paint Trade generally. They are the BEST PROTECTORS of WOOD, CEMENT, and IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to iron. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only to be thinned down for use in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead Colour.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

READY-MIXED PAINTS.

A great variety of Colours ready mixed for the brush are also always kept in Stock, in 3 lb., 7 lb., 14 lb., and 28 lb. cans.

Prices and Testimonials on application.

NOTICE.—In reference to an advertisement which appeared in the JOURNAL of Nov. 4, and some time previous, containing the statement that "comparative experiments . . . . conclusively prove that the 'Sugg' burners give over 30 per cent. of illuminating power more than can be obtained from any other burners with the like quantity of gas," which statement purports to be based on a report given by Messrs. C. Meymott Tidy, M.A., M.B., T. N. Kirkham, M.I.C.E., F.C.S., and Charles Heisch, F.C.S., we think it right to state that, having written to these gentlemen asking for a copy of their report, they reply that they are unable to furnish us with one, as it was a private one of Mr. Sugg's, and two of the gentlemen inform us that **not only were our burners not mentioned in the report they gave, but that they were not even tested.**

The names of the above eminent scientists being associated with the report, gives it an importance it would not otherwise possess; hence the above notice.

We may also state that the report of the Committee of the British Association formed "to inquire as to the best means of consuming coal gas of different qualities," which was presented at the 1878 meeting, and reported in the JOURNAL, showed that, of the two or three score burners tested, which included all those of repute in the market, **Bray's yielded the highest lighting power**, and had the fewest defects—such as "smokes," "blows," &c.—recorded against them.

STREET-LIGHTING IMPROVEMENTS.

BRAY'S

PATENT LANTERNS & FLAT-FLAME BURNERS

Of 30 to 200 CANDLES POWER.

This Apparatus has the following merits, viz.:—

The Burners are of the flat-flame type, which is the only practicable type for Street-Lighting purposes.

Their lighting power is greatly in excess of Flat-Flame Burners made prior to the introduction of these, and, the up and down light being taken into account, it is in excess of that yielded by any Burners, Flat-Flame or otherwise.

The flame in the lantern is remarkable for its steadiness, whiteness, and brilliancy.

The lantern is storm-proof, its efficiency not being materially affected in a gale of wind.

It is practically shadowless, though the top light is allowed to pass freely to the upper parts of buildings, instead of being reflected, in the main, round the base of the lamp, as in some systems.

These Lamps were first exhibited in connection with the Leeds Gas Exhibition, in front of the Town Hall, in conjunction with all the improved systems of Street Lighting now before the public, when the opinions expressed by Gas Engineers and the Public were that this apparatus yielded more light and diffused it better than the other systems there tried. Since this Exhibition they have been improved in several important features, the principal of these being an arrangement whereby the flame is kept in a state of efficiency in the stormiest weather.

So long as we could see any desirable improvement to be effected, we have avoided, as far as possible, sending out our lanterns, or making any public announcement regarding them. We now feel convinced that our apparatus is nearer perfection than any in the market, and offer it with complete confidence.

Price and Particulars on application to

GEO. BRAY & CO.,

LAMP AND "ENAMEL" BURNER MANUFACTURERS,

LEEDS.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

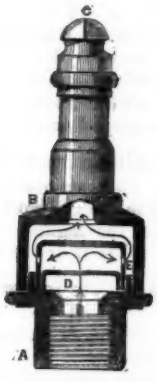
2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

THE "ACME"



REGULATOR.

Sample Boxes containing 1 doz., price 24s.

These Regulators are made in various forms, adjusted to pass from One-half to Sixty cubic feet per hour.

Also made to suit Consumers requirements, price 18s. per doz.

Sole Manufacturers,

THE

LONDON GAS BURNER CO.

Temporary Offices: 29, DUNDAS ROAD, PECKHAM, S.E.

AGENTS:

J. EDMUNDSON & CO., GAS ENGINEERS,

33 to 36, CAPEL STREET, DUBLIN.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
FINSBURY CIRCUS, LONDON.

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c.,

COTSWOOD FIRE-BRICK WORKS, SCOTSWOOD-ON-TYNE.

Also Makers of all kinds of Common Building Bricks, and of Pressed White and Red Bricks for Facing.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

The Dunston Engine Works Co.,

GATESHEAD-UPON-TYNE.

Are the Sole Manufacturers of

Archer's Patent Hoists,

ALSO OF

Archer's Patent Stone Breaker,

AND OF

Archer's Patent Ore Crusher & Pulveriser,

The last-named Machine (without the Pulveriser) makes the best and most durable Coke Breaker.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

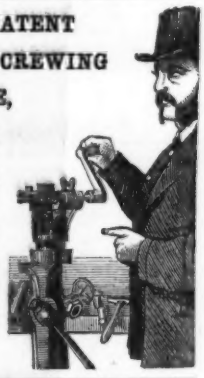
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,



For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

LANCASHIRE.

Gold Medal Awarded, Paris Exhibition, 1878.

THOMAS TURTON AND SONS,

SHEAF AND SPRING WORKS,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS,

STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS,
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

R. DEMPSTER AND SON'S

WOOD SIEVES FOR PURIFIERS,

WITH TAPER OR PARALLEL BARS,

MADE BY SPECIAL MACHINERY.

SCRUBBERS FILLED WITH BOARDS,

On our approved principle, for the extraction of Ammonia.

Prices on application. References to First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, Near HALIFAX.

London Offices: 2, SUFFOLK LANE, CANNON STREET, E.C.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT GAS-BURNERS

FOR

STREET LIGHTING, &c., WHICH REQUIRE NO GLASS CHIMNEY.

Speaking of these burners, erected on the Thames Embankment, the Governor of The Gaslight and Coke Company, at the half-yearly meeting, Aug. 15, 1879, says:

"Any gentleman who may wish to see the light, may do so at the foot of Westminster Bridge, where it is in direct contiguity with the electric light, so that he will be able to judge for himself. There is a light there that completely excels the electric light in the intensity of its illumination, and in the scope of its diffusion. The lamps on Westminster Bridge are some of Mr. Wigham's."

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., GAS ENGINEERS,

19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

J. & J. BRADDOCK,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY CONSUMERS GAS-METERS,

OF THE HIGHEST EXCELLENCE ONLY;

ROUND STATION-METERS,

ON CAST-IRON STANDS;

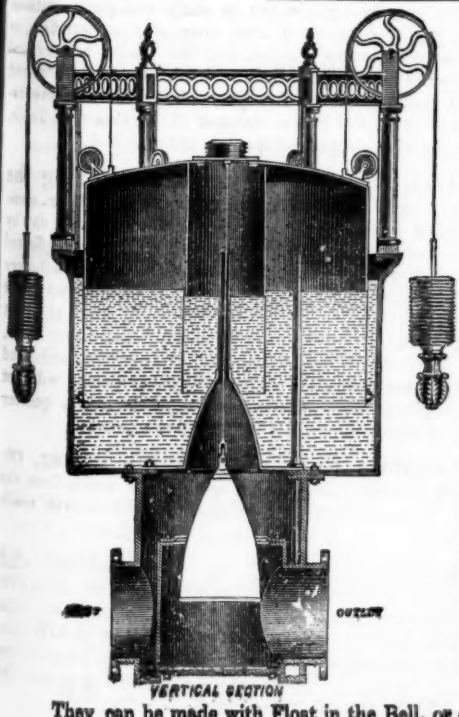
SQUARE STATION-METERS,

WITH PLANED JOINTS.

Messrs. Braddock beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

SANDELL AND SON,

PUBLIC ACCOUNTANTS,

2, GREAT GEORGE STREET, WESTMINSTER.

Sandell and Son having been engaged during the last 25 years in Gas Companies Accounts, either in Preparing or Investigating Statements for Parliamentary Applications, Arbitrations, and otherwise, offer with confidence their Services for similar purposes.

Mr. ROBERT DEMPSTER,

CONSULTING GAS ENGINEER,

ELLAND, near HALIFAX,

May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations is both extensive and reliable.

W. LIDDALL,

Public Accountant,

MOORGATE STREET CHAMBERS,

GREAT SWAN ALLEY,

MOORGATE STREET, E.C.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

HARPER & MOORES,

PROPRIETORS OF THE

BEST STOURBRIDGE CLAYS,

STOURBRIDGE.

Manufacturers of all Descriptions of

BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS

Of all Dimensions for Gas-Works,

GLASS-HOUSE POTS & CRUCIBLES

Established 1836.

The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture. Silver Medal, Paris, 1878.

TO MAKERS OF SULPHATE OF AMMONIA AND BUYERS OR SELLERS OF GAS LIQUOR.

F. SUTTON & CO., Norwich, are now prepared to Supply a Set of Apparatus with Standard Test Solutions for the rapid and accurate analysis of Gas Liquor, which can be used by any intelligent workman, so as to show the actual amount of Sulphate which can be got out of any sample of liquor in a few minutes, without any of the annoyance arising from saturation with acid, &c. Tables are also given, showing the quantity of acid of various strengths required for any given liquor, the accurate ounce-strength and percentage of pure ammonia, &c. Price of the set, with full direction and table (copyright), with materials sufficient for fifty analyses, £4 4s.

Post orders or cheques to be made payable to F. Sutton and Co., Manufacturing Chemists, Norwich, who also supply every description of Standard Solutions for Volumetric Analysis of Waters, Beers, Manures, &c., of guaranteed accuracy.

GAS AND WATER PIPES.

WILLIAM MacLEOD & Co.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B., GLASGOW.

Prices on application.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

HARTHILL CANNEL

Yields 14,920 cubic feet of 40·92-candle gas per ton.

THRASHBUSH CANNEL

12,550 cubic feet of 40·22-candle gas per ton, and 9 cwts. of good coke.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash. This cannel is almost free from sulphur.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full analyses on application at above address, or from WENDERSPOON, FERGUSSON AND Co., 21, Lime Street, LONDON, E.C.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET,

DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

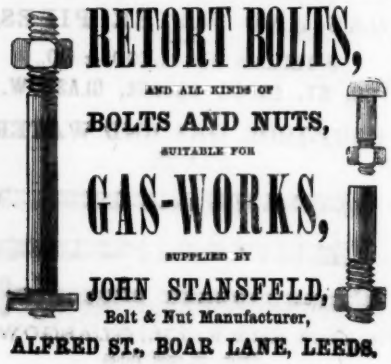
Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

M. BREMOND'S NAPHTHALINE PROCESS.

All negotiations respecting M. Brémond's patented process for preventing Deposits of

NAPHTHALINE

in Gas Main and Service Pipes should be addressed to Mr. W. H. BENNETT, 22, Great George Street, WESTMINSTER, S.W., or to M. BREMOND, Gas Engineer, Compania Madrilena de Alumbrado y Calefaccion por Gas, MADRID, who may be consulted upon all matters connected with the Gas Industry.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—CHIEF OFFICES:

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,

WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

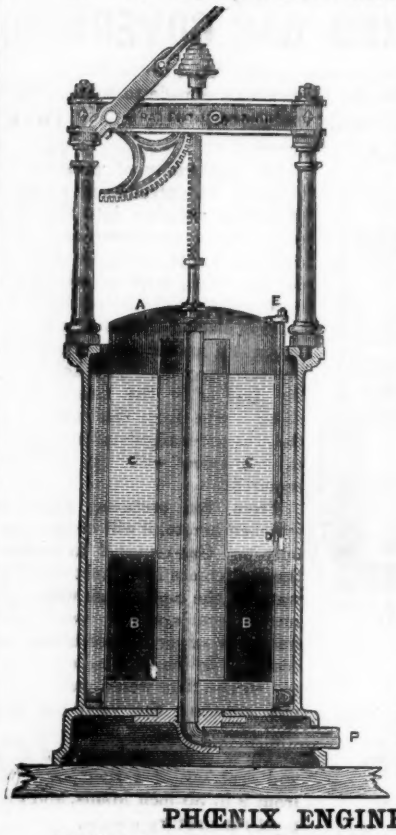
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at

BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
RAMSGATE,
SUTTON,

and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 827.

PHŒNIX ENGINEERING WORKS,

Holland Street and Bear Gardens, Southwark, S.E.

THE WIGAN COAL & IRON COMPANY,

LIMITED,

DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: W. M'GOWAN,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE

RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4. inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

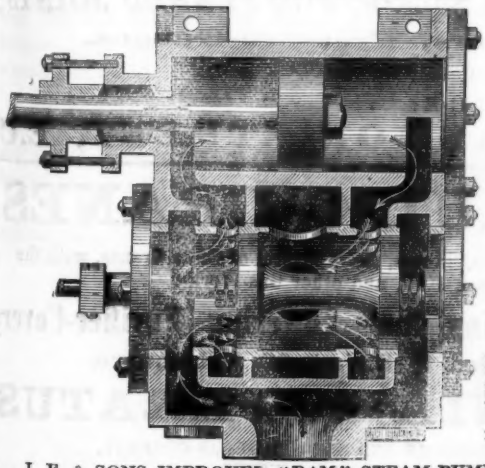
THE "RELIABLE" STEAM-PUMP

IS NOW IN USE AT NEARLY ALL THE

LEADING GAS AND CHEMICAL WORKS THROUGHOUT THE KINGDOM,

INCLUDING

THE GASLIGHT AND COKE CO., BECKTON NEW WORKS (24 supplied),
THE GASLIGHT AND COKE CO., GREAT CAMBRIDGE STREET WORKS, HACKNEY,
THE PHŒNIX GAS CO. and COMMERCIAL GAS CO., LONDON,



BIRMINGHAM,	BRISTOL,
LEEDS,	BRADFORD,
BLACKBURN,	WOLVERHAMPTON,
NOTTINGHAM,	JERSEY,
CARLISLE,	TUNBRIDGE WELLS,
COVENTRY,	RICHMOND,
DERBY,	STRATFORD,
EXETER,	DUDLEY,
LICHFIELD,	and other Gas-Works.

The "RELIABLE" is undoubtedly, by means of its Piston Valve, the best Pump made for Gas-Works use. It is specially adapted for pumping TAR, OILS, AMMONIACAL LIQUOR, &c., and is the ONLY Pump that will do so SUCCESSFULLY and at the same time discharge double the quantity of liquid. The "RELIABLE" is the only Pump manufactured that is REVERSIBLE, and therefore is invaluable in frosty weather.

J. E. & SONS IMPROVED "RAM" STEAM-PUMPS, which are made with both Single and Double Rams and Steam Cylinders, are also admirably adapted for Gas-Works use.

For Price Lists and Testimonials, apply to the Sole Makers and Patentees,

JOSEPH EVANS & SONS, WOLVERHAMPTON,

MAKERS AND PATENTEES OF

PUMPS AND PUMPING MACHINERY FOR EVERY PURPOSE.

NEW PATENT WET GAS-METER,

THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,
238, KINGSLAND ROAD, LONDON.

ALEXANDER WRIGHT & CO.,

55, 55a, & 56, MILLBANK STREET, LONDON, S.W.,

MANUFACTURERS OF

WET & DRY GAS-METERS & GAS APPARATUS,

AND SOLE MAKERS OF

WRIGHT'S REGISTERING PRESSURE GAUGE,

Which has for years been so extensively employed by Gas Companies and others, at home and abroad, have learned that inferior and imperfect dial papers bearing their name, for use with the above instruments, have been and are being produced for and sold by one or more other firms. The genuine dial papers are printed from plates accurately engraved by machinery, so that the scales are correct, which cannot be the case with the spurious papers mentioned above.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW.

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
Governors, Test Holders, &c., &c.

LONDON OFFICE:

6, LITTLE BUSH LANE, CANNON STREET, E.C.

IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at Beckton, Hull, and other Gas-Works.

HYDRAULIC APPARATUS for Lifting and Lowering Purifier-Covers

Sixteen recently erected at Beckton, applied to Covers 30 feet square.

SULPHATE OF AMMONIA APPARATUS

IN SUCCESSFUL OPERATION AT THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD GAS COMPANY, AND IN COURSE OF ERECTION AT THE CARLISLE CORPORATION GAS-WORKS.

Special "REGULUS COCKS" manufactured to stand Acid.

FOR PARTICULARS, APPLY TO

JOHN ABBOT & CO., LIMITED,

2, SUFFOLK LANE, CANNON STREET, E.C., or PARK WORKS, GATESHEAD-ON-TYNE

London: Printed by WALTER KING, for the Executors of the late WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street in the City of London.—Tuesday, November 25, 1879.